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THE

GARDENER'S MONTHLY VOLUME.

THE PINE APPLE;

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,
Author of "The Dictionary of Modern Gardening," "Gardener's Almanack," &c.; and

JAMES BARNES,
Gardener to Lady Rolle, Bicton, Devonshire.

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THE PINE APPLE.

HISTORY.

This Queen of Fruits is found wild in the tropical latitudes of America, Asia, and Africa. Tradition says that, being native of the first of the above-named of the earth's quarters, it was thence exported to the others; and this tradition is uncontroverted by the earliest of the botanical writers to whom it became known. They appear not to have become acquainted with it until the commencement of the 17th century; for neither Lyte (in 1578) nor Gerard (in 1597) notice the pine apple in their "Herballs," published in those years respectively; but Johnson, in his edition of Gerard, which issued from the press in 1633, figures and describes it as follows:—"*Ananas pineas*, the pinia, or pine thistle, is a plant having leaves like the aizoon aquaticum, or water sengreene. The meat of this fruit is sweet, and very pleasant of taste, yielding *good nourishment.* *There* are certain small fibres *in the meat, which, though* they do not offend the mouth, yet hurt the gums of such as too frequently feed thereon." The woodcut demonstrates that it is the pine apple to which his observations refer.

Parkinson, in his "Theatrum Botanicum," published in 1640, is much more copious in his description, more accurate in his delineation, and gives much more information concerning its history. He calls it "Anana seu Pina, the West Indian delicious Pine;" and proceeds to state that it was first brought from Santa Cruz, in Brazil, where it grows wild; and was thence introduced to the East and West Indies, being not a native of either. In Brazil, it was called by the natives *nana* and *anana,* but by the Spaniards and Portuguese *pinas.* Parkinson, however, knew little of its properties, speaking of them only by report, and enumerating as among them, that if the blade of a knife be left sticking in one of them, that portion of the blade will next day be found corroded entirely away. It was certainly not then cultivated in this country, for we had then no glazed structures, which we know are necessary for its successful cultivation; and Parkinson does not even mention it in his great gardening book, the "Paradisus," published in 1656.

It was first introduced into England by Mr. Bentick, afterwards Earl of Portsmouth, in 1690, but *merely as a plant* worthy of being added to our great *national botanical* collection, and without any suggestion that it might be cultivated as a dessert fruit. (*Hortus Kew.*)

Yet the fruit of the pine apple had been made known in England in 1657; for an embassage returning to this country from China, in that year, appears to have brought pine apples thence as a present to Oliver Cromwell. John Nieuhoff, who was secretary to the embassy, describes the fruit very correctly; and Evelyn, in his "Diary," under the date of 9th August, 1661, says, "I first saw the famous Queen pine brought from Barbadoes, and presented to his Majesty (Charles II.); but the first that were ever seen in England were those sent to Cromwell four years since."*

It may be that from the crowns of this, and of others mentioned by Evelyn as sent to the king from the West Indies, in 1668, that Mr. John Rose, his Majesty's gardener, succeeded in raising a fruit of the pine apple in this country. We say it may be, because there is a portrait, in oil colours, of Rose, at Kensington Palace, representing him giving a pine apple to Charles II. Rose was then gardener to the Duchess of Cleveland, and the garden in which the present is being made was that at her Grace's seat, Downey Court, Buckinghamshire.† We do not know whether this is the same, or a duplicate of a similar picture, once in the possession of Earl Waldegrave, and which, Walpole says, was bequeathed by Mr. London, Rose's apprentice, to the Rev. Mr. Pennicott, of Thames Ditton, by whom it was given to himself.

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* Evelyn makes no mention of the pine apple even in the 3rd edition of his "French Gardener," published in 1672.

† There is a copy of this in water colours in the Library of the London Horticultural Society.

If Rose was sufficiently skilful, or so fortunate, as to ripen a pine apple in England, it became immediately afterwards a lost art, for neither Evelyn, London, Wise, Rea, or Switzer, speak of it as an object of cultivation. Soon after Switzer ceased to publish, in 1732, its cultivation was successfully attempted in Holland. This was by M. Le Cour (or La Court, as written by Collinson), a wealthy Flemish merchant, who had an excellent garden at Drieoech, near Leyden, of which he published an account in 1732, and died in 1737. This garden was visited by Miller and Justice, who speak of its proprietor as one of the greatest encouragers of gardening in his time; of his having curious walls and hothouses; and they agree that he was the first person who succeeded in cultivating the pine apple. It was from him, Miller observes, that our gardeners were first supplied, through Sir Matthew Decker. Pine apple plants had been introduced into the Amsterdam gardens long previously, whither some of the plants were *brought from the* Dutch East India settlements, but *more from their* colonies at Surinam and Curacoa, in *the West Indies.* In 1712, the number of pine plants thus collected amounted to about 200, but, though vigorous, they had not yet been brought to a fruit-bearing state. Mr. Le Cour, says Bradley, who was an eye-witness of these facts, was not discouraged by the ill-success of others. He built various stoves, and adopted different modes of treatment, until he, at length, succeeded in producing and ripening several hundred pines annually; and the plants (suckers) increased so fast, that the gardener raised Mr. Bradley's wonder by telling him that hundreds were yearly thrown away. Though Mr. Le Cour succeeded in ripening pines, we should not now say anything in commendation of the fruit he produced, since Bradley, speaking of the first, says "they were about four inches long."

In 1718, the culture of the pine apple was for the first time established in England by Mr. H. Telende, gardener to Sir Matthew Decker, at Richmond, in Surrey. In that year Mr. Bradley saw there forty fruiting plants, of which the smallest fruit was four inches and the largest seven inches in length. (*Bradley's Gen. Treatise of Husbandry and Gardening*, i. 209.) He planted the suckers in August; they bloomed in April, and the fruit was ripe in five months from the time of its first appearing. His pits, built of brickwork, required, for heating, 300 bushels of bark, and he employed tepid water in supplying the plants with moisture. Mr. Telende em ployed a thermometer, that he might be certain of the temperature he employed; and to this, Mr. Bradley recommends the barometer and hygrometer to be added, as guides for the gardener.

In the Fitzwilliam Museum, at Cambridge, is a landscape, by Netcher, in which a pine apple is introduced, and this is there stated to be the first fruited in England, and that it was produced at Sir Matthew Decker's; but if the picture of Rose, before noticed, is correct, this is not strictly in accordance with facts.

Passing to the other portions of the British Isles, we find that pine apples are said to have been first brought to Dublin by a man of the name of Buller, who, in the reign of Queen Anne (1702—1714), settled in the vicinity of Dublin, and held an extensive nursery in New-street, where traces remain of it to this day.

James Justice, Esq., one of the principal clerks of Session in Scotland, first introduced the pine apple into that portion of the kingdom, cultivating it in his garden, at Crichton, near Dalkeith, but where, it is to be regretted, he shortly wasted his fortune by a lavish expenditure on rare plants. He died in 1762. The cultivation of this fruit was now fully established in this country, and we need do little more than enumerate the various separate treatises that have been published on the subject.

In 1767, John Giles, at one time gardener to Lady Boyd, at Lewisham, in Kent, and afterwards foreman to Messrs Russell, nurserymen in that village, published "Ananas, or a Treatise on the Pine Apple." It is the first really practical work, giving full details of the culture of the plant, that issued from the press. For, as he observes in his preface, the directions given by Miller, Hill, Meader, and others, were too short and imperfect to enable the novice to attain success. He gives the plan of a pinery to be heated by the combined influence of tan and flues.

Only two years after Mr. Giles' work, in 1769, appeared another on the same subject, entitled "A treatise on the Ananas or Pine Apple." The author of this was Mr. Adam Taylor, gardener to J. Sutton, Esq. of New York, near Devizes. He claims for himself the merit of being the first who brought the fruit to an improved size and excellence without the aid of fire heat. A coloured engraving of the pine apple is prefixed to the volume, and, if this be the improved size then attained, its predecessors must have been small indeed, for it is only six pips high. That this was so, we may conclude from the drawing of a pine apple published in 1733, by a gardener, at Kensington, named Furber, and this is only four pips in height. Taylor's pit is glazed throughout, except at the back, and is heated entirely by tanner's bark placed beneath *the soil.*

W. Bastard Esq. of Kitley, Devon, informed the Royal Society, in 1777, that he grew pine apples in pots, plunged in cisterns of water instead of the bark bed, and that they were much larger and better flavoured in consequence. They, however, required a higher temperature, and to be near the glass in the upper part of the hothouse, for they would not thrive when so plunged in the lower parts of the house. (*Phil. Transac. ab.* xiv. 224.)

In 1779, Mr. Speechley published his "Treatise on the Culture of the Pine Apple," recording in it his experience relative to its culture whilst gardener to the Duke of Portland, at Welbeck, in Nottinghamshire. He combined the culture of the vine with that of the pine apple, and his structures are designed for that purpose. He gives fuller particulars concerning the insect enemies of the pine apple than do any of his predecessors.

In 1806 appeared "A Treatise on the Culture of the Pine Apple," by-Mr. W. Griffin, at that time gardener to J. M. Sutton, Esq. of Kelham, in Nottinghamshire, as he was subsequently to S. Smith, Esq. of Wood Hall, Herts. This, we consider, displays, as a whole, more correct knowledge of the pine apple's culture than is given in any of the works previously published. The Queen pine apples which he grew averaged more than 5lbs. in weight, and his New *Providences attained to* full 9lbs.

In 1818 Mr. T. Baldwin, gardener to the Marquis of Hertford, at Ragley, in Warwickshire, printed "Short Practical Directions for the Culture of the Ananas," but as he asked a guinea for those few pages he sold very few; though of manuscript copies, at a lower price, he disposed of a considerable number. He was considered the best pine grower of his days, but we consider his directions in no particular superior to those by Mr. Griffin.

About the time that Mr. Baldwin wrote, Mr. Andrews, market gardener, of Vauxhall, adopted steam as a mode of heating his pine stoves and pits.

One of the earliest, if not the earliest instance of steam being used as a bottom heat, with which we are acquainted, was that by Mr. Butler, gardener to the Earl of Derby, at Knowlesly, near Liverpool, in or about 1792. It had been used twenty years before, but chiefly for other purposes. Speechly, in 1796, knew only two instances in which steam was applied as bottom heat.

Mr. John Hay, horticultural architect, also tried the use of steam as early as 1794, when gardener at Preston Hall, near Edinburgh, and he says the application of steam to forcing houses early caught his attention. The first that he designed and executed in Scotland on this plan, was at Preston Hall, in Mid-Lothian, in the *year* 1794. The fruiting pine stove, *which is in the general suit* of houses, with two peach houses on the west, was originally adapted to steam. (*Loudon on Pine Apple*, 172.)

In 1822, Mr. Loudon gathered together, in a useful but ill-arranged volume, "The different modes of Cultivating the Pine Apple," and, just previously, the highly correct scientific views of Mr. Knight, then President of the Horticultural Society of London, appeared in its Transactions.

In 1839, Mr. R. Glendinning, then gardener to Lord Rolle, at Bicton, published "Practical Hints on the Culture of the Pine Apple," and though based on good practice yet they also have the merit of combining with this most sound scientific opinions.

In 1844 and 1845, Mr. Hamilton, gardener to F. A. Phillips, Esq. of Thornfield, near Stockport, and Mr. G. Mills, gardener to the Baroness de Rothschild, of Gunnersbury Park, Middlesex, each published a very excellent "Treatise on the Culture of the Pine Apple."

During the whole of the period these several works were being published, various valuable contributions to our knowledge of pine culture also appeared in periodicals of the day: from these and from the works named we have gleaned what we considered original and valuable, assigning as far as possible tribute to whom tribute is due.

In 1820, the pine apple began to be sent to England *in abundance from* the West Indies, although the shortest passage was then six weeks. This greatly lessened their price, and rendered them more common. They were sold at fruit-stands in the London streets, in one or two places, during the summer months; and moderate-sized fruit were to be had from half-a-crown to a crown each; or at two shillings a pound.

The first importation to London was of 400 Green Providence pines from the Bermudas, which were purchased by Mr. Mart, fruiterer, in Oxford street.

The annual importation of this fruit from the West Indies, and as it is said from Nassau, in New Providence, has increased to many thousands, and they, during the season, crowd the fruiterers' stalls, fetching from 1s. to 6s. each. They are small, and mostly ill-grown, many not weighing more than half a pound, and none that we have seen exceeding two pounds. Some are in good condition, but many are rotten, and must have heated on the passage. To what variety they belong it is impossible to say, as they are quite unlike the specimens that ripen in this country. It is, however, not improbable that they are small Providences. (*Gard. Chron.* 1843, 575.)

In consequence of the success attending the importation of pine apples from the Bahamas in 1844, upwards of 10,000 additional acres were set apart for their *cultivation at New* Providence, and about an *equal quantity at the* small Island of Eleuthera in

1845. In order to improve the cultivation, some thousand offsets of the most approved sorts were sent over to the West Indies last year from this country, and several parties well versed in the cultivation of this fruit have proceeded thither to turn that knowledge to a profit.

The taste for the fruit is becoming more excited in this country, and now that glass is so reduced in price, and better information concerning pine culture is diffused, we expect to see it much more generally pursued.

The pine apple has never been so generally cultivated in this country as it might have been, from an idea that its culture is attended with more difficulty and expense than that of any other fruit; and, also, from the circumstance of the great number of gardeners being ignorant of its cultivation. With respect to the difficulty of cultivating this fruit, every gardener, who knows any thing about it, knows it is much easier grown and fruited than the cucumber early in spring, or than the melon at any period of the year. In short, with the single difference of requiring an artificial temperature, it is as easy, or easier, to grow than a common cabbage. It is not nearly so liable to insects as that plant is in dry seasons; and of two plantations, the one of crowns or suckers of pines, and the other of seedling cabbages, we may venture to assert, that more of the former will perfect their fruit than those of the latter will perfect their loaf or head. (*Loudon on Pine Apple,* 146.)

The only other country in Europe where the pine apple has been spiritedly cultivated is France.

The establishment of Versailles is the largest in France, but that of Meudon is also remarkable for excellent culture, and the high state of perfection to which this fruit is brought. This is one of the King's private establishments; the Chateau is never occupied by the Royal family, and M. Pelvillain, the chief gardener, is allowed the kitchen garden on his own account. The pine is his hobby, and he spares no trouble or expense in bringing it to perfection; so ardent is his desire to obtain information, that he is learning the English language for the express purpose of reading our treatises and visiting our country, that he may be able to judge for himself of the advantages or defects of the different modes of treatment. He uses peat, and also adopts the open ground culture; and certainly it would be difficult to find plants more vigorous, or finer fruit at Christmas, than he produces; it is no unusual thing to see in his houses Providence, Cayenne, and Enville Pines, weighing from 8lbs. to 10lbs. The Queens, however, are not large, certainly not more than from 2lbs. or 3lbs. on the average; these last he grows principally in pots for the market. The confectioners of Paris seldom buy *the larger kinds, they prefer* a middle-sized Queen to any other; it would, therefore, be useless for him to take any extraordinary trouble in getting this variety very large. He has also raised several seedlings within the last four years; one of them was sent out about two seasons since; it is not, however, considered any great improvement upon the original. (*Gard. Chron.* 1844, 55.)

Mr. Dunsford, gardener at Copesthorne Gardens, writing upon the cultivation of the same French establishment, observes, after personal inspection:—The pine is grown to perfection at the Meudon gardens, by M. Pervillian. There, quantity and quality are combined, and the whole of the plants are fruited without pots, on what is termed the system of open-frame culture; which is a very great saving, both in time and expense, as it does away with the cost of pots and the trouble of potting, and in a great measure with the fermenting materials required for bottom-heat. The suckers produced by the fruiting plants of last season are allowed to remain on the plant after the fruit is cut until the following March, at which period, if the plant be a strong one, the sucker, when taken off, will be almost a full-grown succession plant. These suckers are not potted, as is generally the case in this country, but planted out in a frame, previously prepared with half-rotten leaves, made into a bed, *from three to four* feet high, with little or no heat in *it, as at this time* (March) we look forward to a daily increase of solar heat. This is particularly the case in France, which is favoured with a clearer sky. Half the trouble in linings of dung, which are so necessary in this country, is thus dispensed with. The linings added to the bed of half-rotten leaves, before mentioned, are found to produce heat sufficient to induce the plant to form roots. These are soon followed by others into the mould on the surface of the bed, and when this takes place, the rapidity of their growth may easily be imagined. The principal attention they require after being rooted, is to syringe them almost daily with tepid water, and to keep up a humid atmosphere. As the plants advance in growth, the frame must be raised to give them head room. About the month of August, the plants will be large enough to remove to their fruiting quarters, which at Meudon, and at the Baron de Rothschild's, are a low-roofed house or pit, just wide enough for containing three rows of plants, with a walk at the back. This is heated by flues or fire-heat, which, for plants of that size, is equally as good as hot water, being only intended for drying up the damp, and keeping up a moderate warmth during the winter months. There is no doubt, however, but hot water would be the best for practising the above system in this country. The floor of the house is filled in, to the depth of 16 or 18 inches, with the best soil that can be procured. Loam is very difficult to obtain in the neighbourhood of Paris; in fact, good loam, such as pines are grown in near London, is not to be procured by any means; so that, while pine-growers in France have the advantage in climate, we on this side of the water have a decided advantage in soil. The principal part of their pines are grown in peat: at the Baron de Rothschild's, they have above a thousand pine plants, all growing in that soil. When the plants are ready for removing, it is performed in the following manner:— The frame is first lifted from the plants, so that they can be got at from all sides; then the plants are raised with a spade, care being taken to remove them with as much soil adhering to their roots as possible. They are then planted carefully in the pit above mentioned, three or four inches deeper than they originally were, to encourage new roots, which, by being kept close, and shaded for a few days, if necessary, they will soon make. After the plants are thus established in their final quarters, no other attention is required, but the general routine of culture adopted for fruiting plants generally, viz., plenty of heat and moisture. (*Ibid.* 1843, 174.)

The Potager, or King's Kitchen Garden, at Versailles, was laid out by "La Quintinie," in the time of Louis XIV., and no expense was spared to render it a worthy appendage to the palace of Versailles, *which was then* the residence of the gayest court in *Europe.* *The* present distribution of the fruit garlen retains a great similarity to the plans of La Quintinie, in 1681, with the exception of the forcing department, which, at that time, consisted only of a few frames for melons, cucumbers, and small salads. It was not till about the year 1702 that the pine apple was introduced into the Potager, and so little was then known of its culture, that no mention is made of any fruit having being obtained till 30 years after; in fact, this and other tropical fruits do not appear to have received much attention until the time of the Empire; since the peace, still greater improvements have been made; many new houses, especially for pines, have been erected, and the hot water system all but entirely adopted. The honour to which it has now attained is more particularly due to M. Massey, the present director of the Royal Gardens, and to the chief gardener in the forcing department, M. Grison, who have, within the last few years, so successfully introduced the open bed system of culture. The whole of the succession pits and fruiting houses are now heated by hot water; tan has been entirely discarded: all the water pipes are of copper,—some round, others open, gutters, 5 or 6 inches wide, by 3 deep, like those in use at the Hon. R. Clive's, at Hewell: these last are now coming into general use for bottom heat. In England almost all the pipes for warming the atmosphere are round; there, on the *contrary, the greater part* are flat and upright, from

6 to 8 inches high, and 1 inch thick; in these the water is said to circulate quite as freely; and moreover a great advantage is gained by the comparatively short time in which any given degree of heat may be obtained, the difference being about 3 to 5; on the contrary, however, it is lost quite as rapidly. The boilers are of copper, and of a form totally unlike those used in England; none are conical, and the makers appear to think that form no way superior to theirs. The soils used in England and France for pines are altogether different; in almost every British pinery, a strong loamy soil is predominant, but at Paris, Versailles, and at almost every other place in France, pines are now grown in peat; some persons have tried loam and leaf-mould, others loam and peat, or common earth and black sand, but none of these composts have proved satisfactory; nevertheless, many eminent horticulturists, and among them M. Poiteau, the editor of the "Bon Jardinier," still think that a stronger soil would be better suited to the end in view; not so, however, the actual growers; the universal opinion among them is, that pure peat is for every variety the best adapted to ensure a rapid growth, which they consider so essentially necessary to obtain large fruit; and certainly the health and vigour of the plants, and the enormous fruit which *has been obtained* in this soil, would lead you to believe *their opinion well* founded. The treatment of the

plants when young, and indeed throughout all their stages in pots (with the exception of soil), is very much the same as in England. The suckers are planted in August and September, and remain till May in the pits of the lowest temperature, when frames for the summer are prepared of dung and chesnut or oak leaves, well mixed and sweetened, of four feet thickness, which is found to retain a steady bottom heat of 18 to 20 degs. of Reaumur (72 to 75 degs. Fahr.) for a much longer time than from dung alone; upon this is a bed of peat (sometimes mixed with a few decayed leaves and black sand), about eight inches deep, in which the young plants are set at sufficient distance apart to allow for six months' growth. These frames are well protected by straw mats at night, and as the summer advances air is liberally given, and water as occasion may require. Rapid progress under this treatment is soon apparent; here they remain till the end of September or middle of October, when they are once more repotted, in twenty-fours or sixteens, in pure peat, and placed in the winter pits with a bottom-heat of 22 or 25 degs. of Reaumur (82 to 88 degs. Fahr.). In the following May those which are to fruit in pots are shifted into sixteens or twelves, while those for the open ground are planted in the fruiting houses, the soil of which is pure peat 9 or 10 inches deep; the *bottom heat is now* increased to 25 degs., and the air is never below 17 or 18 degs.; in September and October many of the plants are showing fruit, which comes to maturity in time for the Paris season, which commences in December. Such is a brief outline of the open bed system, as practised at Versailles and elsewhere. This treatment has not, however, been found equally advantageous to every kind of fruit; it is only in the Cayenne, Enville, Jamaica, Providence, and one or two other varieties, that the increase of size has been most apparent; very little difference has been perceptible in the size of the Queens (at least at the Potager), and by far the greater number of this kind are still grown in pots. The number cultivated in this garden is above 2000; more than two-thirds are Queens; then follow the Providence, Cayenne, Enville, and Jamaica. Many others are grown for the sake of variety, such as Antigua, Poli blanc, Moscow Queen, &c. &c.; but the first named sorts constitute the grand resource for the Royal Family and Court. (*Gard. Chron.* 1844, 6.)

BOTANICAL CHARACTERS.

Ananassa Sativa, the pine apple, is one of a genus included in the Hexandria Monogynia class and order of the Linnean system, and in the natural order *Bromeliaceæ.* It is the Bromelia ananas of earlier Botanists.

Leaves, ciliate-spinous, sharp-pointed, spike comose. *Root*, perennial, fibrous. *Root-leaves*, from 2 to 3 feet long, and from 2 to 3 inches broad, channelled, often a little glaucous. *Stem*, short, cylindrical, thick, leafy. *Spike*, glomerate, dense, scaly, oval or conic, crowned with a tuft of leaves, similar to the root and stem leaves, but smaller. *Flowers*, bluish, sessile, small, and scattered upon the common, thick, fleshy *receptacle*, which, after the flowers fall off, increases in size, and becomes a succulent fruit, covered on all sides with small triangular scales, and resembling the strobile of the genus Pinus, whence its common English name is derived. It is a native of South America, and is now found wild also in Africa and Hindostan.

Although a native of tropical climates, it must not be supposed, however, that the pine apple plant is an exotic of a very tender kind; for, on the contrary, if removed from a temperature of 100 degs., and placed in one nearly freezing for hours, it will exhibit no immediate external change, or that flacidity whic would mark the appearance of most other exoti similarly treated. (*Glendinning on Pine Apple*, 8.

As it is not a tender, so, neither, is it a short-li plant. We have seen in India an old root that continued to bear fruit annually for six or se years, and the suckers on which were still in *vigour*. *Mr. Hamilton*, after some years' expe also concludes that a pine apple plant, cultivated without injuring its roots, or moving it, as was the old system, might be fruited from for fifteen years. We are not aware of any chemical analysis of any part of this fruit.

VARIETIES.

For the following list of varieties, and the detail of their characteristics, we are chiefly indebted to the publications of the London Horticultural Society. We have included as varieties some which, by most Botanists, are considered as species, but in these instances we have appended their specific botanical names. The average weights are from the Society's Catalogue, but they are now much below the average weights to which pine apples are grown.

Allen's Seedling, see Mealy-leaved Sugarloaf.

Anson's (Anson's Queen, Lemon Antigua). Leaves long, rather more slender and erect than in the Otaheite, to which it bears a considerable resemblance, particularly in the spines, which are middle-sized, and in the flatness of the leaves. Flowers purple. Fruit cylindrical; before ripening of a darkish green and rather mealy; when ripe of a bright lemon colour. Pips rather above the middle size, prominent at the margins, and depressed in the centre. Scales covering half the pips, and ending in narrow acute points. Flesh white, opaque, entirely without stringyness, very sweet and pleasant, but without acidity. Crown middle-sized, leaves not very numerous. This variety was raised from seed, probably, at Shugborough.

Antigua, Black, (Brown Antigua of Speechley; Antigua, Jagged-leaved Antigua, Wortley's West Indian).—It is readily distinguished by its leaves, which are very long, narrow and acute, rather spreading, of a clear bluish green, the inner leaves being much tinged with a pale brown, upper surface slightly mealy, lower surface very mealy. Spines large, far apart, and regular. Flowers purple. Fruit cylindrical, inclining to oval; before ripening, of a dull purplish green, and thickly covered with meal; when ripe, dark ochre. Pips very large and prominent. Scales covering rather more than one-third of the pips, and terminating in short blunt points. Flesh pale yellow, slightly fibrous, rather soft and melting, with a pleasant acid, remarkably juicy, sweet, and highly flavoured. Crown small. Leaves few and erect. Average weight 5 lbs. Should be cut just before ripening.

Antigua Brown, see New Jamaica.

Antigua, Copper Coloured, see Montserrat.

Antigua, Green, (Smooth-leaved Green Antigua, Smooth Green Havannah, Sans Epines, Malabarica). —Average weight 4 lbs. Its leaves are considerably shorter than those of the Havannah, and of a pale colour; they are also broader, more keel-shaped and much stronger than in that variety, and also entirely destitute of spines. Flowers of a very pale lilac colour. Fruit globular, sometimes inclining to oval; before ripening of a dark green, and very thickly covered with meal, when ripe deep yellow. Pips middle sized, roundish, and projecting to a ver acute point. Scales covering about one third of th pips, and ending in narrow short points. Fles deep yellow, transparent, rather stringy, with a litt acidity, but neither very sweet nor highly flavour Crown rather large, leaves numerous and reflexe

Antigua, Lemon, see Anson's.

Antigua Rubra, see Montserrat.

Antigua Aurantiaca, see Smooth Havannah.

Antigua, Smooth Leaved, see Havannah.

Bagot's (Lord) Seedling.—Average weight 3lbs. Leaves remarkably short, broad and flat, bluish green, and thickly covered with meal. Spines, middle-sized and rather irregular. Flowers, lilac. Fruit, bluntly pyramidal; before ripening, dark greenish purple, and thickly covered with meal; when ripe, pale yellow. Flesh white, opaque and firm, with scarcely any fibre, very juicy, and highly flavoured. Crown small, leaves not numerous.

Barbadoes, Lemon-coloured, see Lemon Queen.

Barbadoes, Black, see Black Jamaica.

Barbadoes, White, see Lemon Queen.

Bird's-eye Bahama, see Striped Sugarloaf.

Blithfield Orange.—Colour of flowers, black. Form of fruit, pyramidal. Average weight 3½lbs. The leaves of this variety bear a strong resemblance to those of the Enville, but differ in being much weaker and less mealy. Spines, middle-sized. The fruit is rather broader at the top than in that variety; the pips are also somewhat larger and less mealy; the colour when ripe bright ochre. Flesh, pale yellow, rather soft and melting, with a pleasant highly-flavoured juice. Crown small, leaves not numerous.

Blood Red (Blood, Claret, Jamaica Purpurea).—This pine is readily distinguished by the purplish red colour of its leaves, which are long, broad, and rather erect. The spines are large and regular. Flowers lilac. Fruit cylindrical, sometimes tapering a little to the summit; before ripening, dark purple and very mealy; when ripe, a reddish chocolate colour. Pips middle-sized, slightly prominent, and half covered with the scales, which terminate abruptly in very short points. Flesh white, rather soft and melting, somewhat fibrous, neither very juicy nor highly flavoured. Crown middle-sized, leaves rather numerous and erect. It was imported from Jamaica by the late Major Morrison, of Gunnersbury, under the name of Buck pine, and unnamed plants of it were also received from St. Vincent.

Bogwarp, see Montserrat.

Brazil, see *ib.*

Brazilian Scarlet, see Scarlet.

Buchanan.—Spines middle-sized.

Buck's Seedling.—Colour of flowers lilac. Average weight 12lbs. This variety greatly resembles the Trinidad, but differs in the following particulars: The leaves are not of so robust growth, they are considerably paler, more mealy, and entirely free from any tinge of brown and red, nor are the spines so strong or irregular. The fruit is pyramidal, and before ripening is rather paler and more mealy, the scales much longer, and of a dull whitish or grey colour. The flesh is also somewhat paler, with a richer and more highly flavoured juice. Raised from seed at Elford.

Cape Coast, see Montserrat.

Caraile, Black, see Antigua Queen.

Caraile, Yellow, see *ib.*

Claret, see Blood Red.

Cochineal, see Montserrat.

Cockscomb, see Enville, Welbeck Seedling, an Trooper's Helmet.

Cockscomb, Russian.—Average Weight 4lbs. good summer fruit. Leaves rather long, broad, a somewhat furrowed, slightly spreading, and rath flat, with revoluted margins of a bluish green, a very lightly tinged with brown, very mealy. Spi rather strong, far asunder, and regular. Flow lilac. Fruit globular, rather tapering to the sum before ripening, of a dark green and rather me ripe, pale orange. Pips rather above the m size and flat, sometimes having small tubercles at some of the angles; scales covering nearly one half the pips, ending in long blunt points, which adhere closely to the fruit. Flesh, pale yellow, rather transparent, very juicy and sweet, with a rich pleasant acid. Crown rather small, leaves broad and spreading.

Copper, see Montserrat.

Copper Coloured, see Black Jamaica.

Copper Coloured Barbadoes, see Black Sugarloaf.

Crown, see Welbeck Seedling.

Demerara, New (Harrison's New).—Average weight 4lbs. Leaves strong, very broad, and rather long, slightly keel-shaped and spreading, of a dull green colour, and tinged with reddish brown on the upper surface; the lower surface is remarkably mealy, a feature by which it may be readily distinguished. Spines, rather minute and regular. Flowers, lilac. Fruit globular, depressed at each end, of a dark green colour before ripening, afterwards a dull ochre tinged with red; very mealy on the centre part of the pips, which are large and prominent. Scales covering half the pips and ending in narrow lengthened points. Flesh white and firm, very juicy, but not highly flavoured. Crown large, leaves rather long and erect.

Dominica, see Mealy-leaved Sugarloaf.

Elford.

Enville (Old Enville, Enville Sugarloaf, Cockscomb).—Average weight 5lbs. Leaves not very long, but rather broad and strong, slightly keel-shaped, somewhat recurved, of a bluish green, and remarkably mealy; spines middle-sized, thickly set, and very irregular. Flowers, lilac. Fruit pyramidal, of a dark purple, tinged with a brownish red before ripening, and very mealy; afterwards of a deep reddish yellow, with pale copper-coloured scales, which cover about one-third of the pips, and terminate in lengthened acute points. Pips generally about the middle size, and slightly prominent. Flesh almost white, opaque, soft and melting, without much fibre, juicy, rather rich and sweet, with a peculiar and pleasant perfume. Crown small, often cockscomb shaped. Raised from seed at Enville Hall, the seat of the Earl of Stamford and Warrington, but at what time is rather uncertain.

Enville, Spring Grove.—The average weight 3lbs. Leaves short, broad and flat, with revolute edges of a bluish green colour, much tinged with brownish purple, and rather thickly covered with meal. Spines middle sized, and rather thickly set and regular. Flowers, lilac. Fruit pyradimal, very broad at its base; before ripening, dark green and rather mealy; when ripe, dark yellow. Pips middle sized, rather flat, and somewhat depressed in the centres. Scales covering rather more than half the pips, and terminating in very short points. Flesh, very pale yellow, slightly fibrous, very juicy and rather sweet, but not highly flavoured. Crown very small, leaves not numerous.

Enville, New.—Spines middle sized; colour of flower, lilac; form of fruit, pyramidal; quality, second rate; average weight 5lbs.

Globe.—Average weight 4lbs. Readily distir
guished by the rigid and erect character of its leave
which are rather narrow and slightly keeled, a blui
green, and very mealy, especially on the under s
face. Spines, middle sized and regular. Flow
lilac. Fruit globular, sometimes rather cylindr
of a dark olive colour before ripening, afterwards
darkish yellow, slightly mealy. Pips middle s
very slightly prominent. Scales covering abou
third the pips, and terminating in rather lengt
points. Flesh yellow, transparent, very juic
slightly fibrous, sweet, rich, and rather acid.
small, leaves not numerous.

Globe, English, see Black Jamaica.

Globe, Buck's Seedling.—Average weight 5lbs. Leaves long, rather narrow, somewhat keel-shaped and spreading, of a bluish green, slightly tinged with brownish purple, and thickly covered with meal. Spines middle sized, not very strong, but very irregular. Flowers, darkish lilac. Fruit cylindrical, somewhat inclining to a globular form; before ripening, of a dingy dull green, and a little mealy; when ripe, darkish orange. Pips somewhat below the middle size, and a little prominent. Scales covering about half the pips, and ending in lengthened narrow points. Flesh pale yellow, rather close, firm and juicy, with a rich, highly flavoured acid. Crown small, leaves broad, short and reflexed. Raised from seeds in 1819, by Mr. William Buck, gardener to the Hon. F. Greville Howard, at Elford, in Staffordshire.

Globe, Fisherwick Striped.—Spines small; colour of flower, lilac; form of fruit, round; quality, second rate; average weight 4lbs. Readily distinguished from all others by its leaves; in appearance somewhat resembles the King pine, but differs in the following particulars:—The leaves have weak irregular spines on their margins, they are rather of a darker green, slightly tinged with pale brown, more particularly in the centre of the plants; they are also somewhat thickly interspersed with silvery specks on the under surface. Said to have originated at Fishwick, the seat of the Hon. F. G. Howard, from a stool of the Globe pine.

Globe, Russian.—Average weight 3lbs. Leaves rather short and broad, somewhat keel-shaped, spreading, and a little furrowed; of a dull green, much tinged with a dark brown, slightly mealy. Spines, large, long, thinly set and regular. Flowers lilac. *Fruit globular,* sometimes tapering to the summit; *before ripening,* dark purplish green, and thickly covered with meal; when ripe, darkish orange, inclining to a copper colour. Pips large, flat, and a little depressed in the centre. Scales, covering about one third of the pips, which end in long acute points, closely adhering to the fruit. Flesh of a clear yellow, slightly fibrous, very juicy and sweet, with a rich highly perfumed flavour. Crown rather large, leaves broad and spreading. Imported from St. Petersburg by the Society in 1819.

Gold Striped, see Silver-striped Queen.

Green-leaved, with Purple stripes, and spines on the edges, see Striped Sugarloaf.

Harrison's New, see New Demerara.

Havannah (Brown Havannah, Smooth-leaved Antigua, Ripley of some, Old King of some, Semiserrata, Lapete.) Average weight 4lbs. Leaves very spreading, narrow and long, of a light bluish green, considerably tinged with pale brown, and slightly mealy. Spineless except sometimes, when a few appear near the points. Flowers purple. Fruit cylindrical, sometimes tapering a little to the summit, before ripening dark purple and rather thickly covered with meal; when ripe, darkish orange. Pips large, flat, and a little depressed in the centre. Scales covering about one-third part of the pips, and ending in a long reflexed point. Flesh pale yellow, rather solid, and without much fibre, juicy, but neither sweet nor very highly flavoured. Crown large, leaves numerous, long and spreading. Origin unknown. Cultivated by Speechly, at Welbeck, before the publication of his Treatise. Not a favourite with gardeners by reason of the spreading character of its leaves.

Havannah, see King.

Havannah, Downton (Knight's Seedling.)—Spines small. Colour of the flower purple. Form of fruit cylindrical. *Quality,* second rate. Average weight *4lbs.*

Havannah, Smooth (Green Havannah, Antigua Aurantiaca.)—Spines none. Colour of flower purple. Form of fruit cylindrical. Quality second-rate. Average weight 4lbs. The leaves of this are rather less robust than those of the Common or Brown Havannah, and of less robust growth, rather more tinged with brown, and much more mealy. The fruit is of the same form and appearance as the Havannah, but is seldom so large. The flesh is of the same colour and consistency, but abounds with a rich, sweet, highly flavoured juice. The crown is generally considerably smaller than in that sort. The origin of this pine is unknown, it is not however of recent origin or introduction, having been grown for a considerable length of time in the pine stoves of different parts of England.

Havannah, Smooth Green, see Green Antigua.

Hussar, see Trooper's Helmet.

Indian Creole, see Montserrat.

Jamaica Black (Jamaica, Black Barbadoes, Copper-coloured, Tawny, St. Vincent's Sugar-loaf, Montserrat of some).—Average weight 4lbs. Best winter pine. Leaves rather long and narrow, slighty spreading, and somewhat keel-shaped, of a dull green, tinged with a dark brown colour, and rather mealy. Spines small, short, regular, and thinly set. Flowers, purple. Fruit, oval, not much lengthened, rather compressed at the ends; colour, before ripening, very dark olive; afterwards a dark orange, inclining to that of copper. Pips, roundish, irregularly angular, about the middle size, rather prominent at the margins and concave in the centre. Scales, covering one-third the pips, and terminating in lengthened points. Flesh, pale yellow, opaque, firm, slightly stringy, very rich, juicy, and high flavoured. Crown, large, spreading, and very mealy.

Jamaica, New (New Black Jamaica, Brown Antigua, English Globe, St. Kitt's, Montserrat of some). —Average weight, 3½lbs. Good in summer. This differs from the Black Jamaica in the colour of the leaf, which is rather paler, and in the margins being slightly reflexed. Leaf spines, small. The fruit is pyramidal and slightly mealy. The colour black (hence Speechley's name), on approaching maturity changing to that of a dark orange. Pips differ from those of the Black Jamaica by being half-covered with the scales, and rather more prominent and angular. Flesh, pale yellow, somewhat opaque, slightly fibrous, sweet and rather acid, very pleasant, rich, and high flavoured. Crown, middle-sized, leaves rather numerous and spreading.

Jamaica Purpurea (see Blood Red.)

Java, Green (Narrow-leaved Java). — Average weight, 4lbs. Readily distinguished by its long, broad, palish, green leaves, with small feeble spines; they are also very flat, and entirely free from any tinge of brown or purple. Flowers, large, dark, bluish purple. Fruit oval, sometimes tapering a little to the summit, weighing from 4 to 5lbs.; before ripening, light green, and lightly covered with meal; when ripe, of a fine clear citron colour. Pips rather above the middle size, and flat. Scales cover fully one-third of the pips, and end in long narrow points. Flesh, pale yellow, rather soft, juicy, and melting, with a rich pleasant acid. Crown, middle-sized, leaves not very numerous. Obtained by Sir Thomas Stamford Raffles, during his residence in Java.

Java, broad-leaved, see Trooper's Helmet.

King (Grassgreen King, Common King, Old King, Havannah of some). Spines none. Average weight, 3lbs. This is the "Ananas viridis inermis," of th French. *Leaves, rather long,* somewhat broad an *keel-shaped, margins destitute* of spines, and som *times a little undulated;* of a clear shining lowish green, and entirely free from mealiness; its growth is also very peculiar, the centre leaves embrace each other very closely, and require considerable force to separate them. Flowers, purple. Fruit, cylindrical, inclining to ovate, of a bright olive colour before ripening, bright orange when ripe. Flesh, yellow, opaque, firm, and free from fibre, sweet and pleasant, with very little acid. Crown large. This pine, according to Martin, in his edition of "Miller's Dictionary," was raised from seeds taken out of a rotten fruit which came from the West Indies, to Henry Heathcote, Esq.

King, see Havannah.

Knight's Seedling, see Downton Havannah.

Lahete, see Havannah.

Malabarica, see Montserrat.

Mocho, see Brown-leaved Sugarloaf.

Montserrat (Copper, Cape Coast, Bogwarp, Red Ripley, New Ripley, Copper-coloured Antigua, Cochineal, Brazil, Malacca, Sumatra, Antigua Rubra, Indian Creole).—Easily distinguished from all other variety by the dark purple colour of the spines, which are rather small and irregular; good specimens of it will weigh from 3lbs. to 5lbs. Flowers purple. Fruit cylindrical, sometimes broader at the top and narrowing downwards; before ripening, dark green and mealy; afterwards of a pale orange, tinged with a copper colour. Pips, middle sized and rather flat. Scales covering one-half the pips, of a deep red towards the points, which are rather lengthened. Flesh solid, lemon-coloured, semi-transparent, somewhat mealy, juicy and acid, without much flavour or sweetness. Crown rather large, leaves numerous.

Montserrat, see Black Jamaica and New Jamaica.

Montserrat, Heaton House, see Ripley.

Olive Green, see St. Vincent's.

Olive, New Green, see Green Providence.

Olive, Striped-leaved, see Striped Queen.

Ordinaire, see Queen.

Otaheite (Anson's).—Average weight 6lbs. Very handsome. Leaves long, rather broad, and of erect growth, nearly equal in breadth until near the top, where they terminate rather acutely; they are also particularly flat, and of a dark bluish green, slightly tinged with brown, and a little mealy on the upper surface, very mealy on the lower surface. Spines middle sized and remarkably irregular. Flowers, lilac. Fruit cylindrical, inclining to oval; upon ripening, deep olive green, covered densely with a cinereous meal; when ripe, orange yellow. Pips large and flat. Scales covering rather more than one-third the pips, and ending in short points, which adhere closely to the pips. Flesh, pale yellow, rather stringy and slightly acid, with an abundance of juice, but not particularly well flavoured. Crown small, leaves rather few and erect.

Peploe Seedling.—Spines middle sized; form of fruit cylindrical; quality second-rate; average weight 3½lbs.

Pitch Lake, see Trinidad.

Prince of Wales's Island, see Striped Surinam.

Prince of Wales's Island, Striped, see *ib.*

Providence, Green.—The leaves of this sort are very distinct from all others; they are long, ver broad, slightly spreading and keel-shaped at the bas tapering to a lengthened point; the upper surface dull green, with scarcely any meal, the lower surfa is very mealy. Spines middle sized and regul Flowers purple. Fruit pyramidal, broadish at top; before ripening of a dark green, when ripe c pale orange, slightly mealy. Pips rather above middle size and slightly prominent. Scales cove one-half the pips, with long narrow pointed yellow, opaque, slightly fibrous, swe pleasant, without much acid. Crown small, leaves not very numerous. Average weight, 4½lbs. This variety was obtained from seed at Wollaton, the seat of Lord Middleton.

Providence, Prickly, see Welbeck Seedling.

Providence, White (Providence, New Providence, Mealy-leaved Providence, Wollaton Providence, Wollaton Green Providence). — Average weight 7lbs.; largest of the varieties here enumerated, excepting the Trinidad. Leaves large, long, broad and spreading, of a light bluish green colour, sometimes blotched with a deeper shade, and very mealy; spines very small, thickly set and rather irregular. Flowers large, dark purple. Fruit oval or tun shaped, nearly equal in size at top and bottom, very dark green or purple, and thickly covered with meal; on approaching maturity gradually changing to a reddish yellow. Pips very large and nearly flat, sometimes a little depressed in the centre. Scales covering nearly half the pips, and terminating in shortened blunt points. Flesh white, opaque, sweet and juicy, without much flavour, slightly stringy and rather soft and melting. Crown large, leaves numerous and rather spreading.

Queen (Broad Leaved Queen, Common Queen, Narrow Leaved Queen, Ordinaire).—Average weight 2½lbs., though it can be grown much larger. One of the best and most useful. Leaves very short, broad and stiff, somewhat spreading and keel-shaped, of a bluish green, and thickly covered with meal. Spines large, strong, rather far apart and regular. Flowers lilac. Fruit cylindrical; before ripening, a lightish green and mealy; when ripe, a rich deep yellow. Pips rather below the middle size and a little prominent. Scales covering rather more than one-third the pips, ending in lengthened points. Flesh pale yellow, very slightly fibrous and melting, remarkably juicy and sweet, with a rich pleasant acid. Crown middle sized, leaves numerous and a little

ding. The origin of this variety is uncertain ;
the Ananas Ovale of Miller's Dictionary, and
bly the sort originally introduced into this
ry.

een, *Anson's*, see Anson's.

een, *Antigua* (Black Caraile, Yellow Caraile,
Effingham's).—Average weight 4 lbs. Leaves
broad, keel-shaped, and slightly spreading,
reen, and very mealy on the under surface.
large, strong, far asunder and regular. Flow-
rk lilac. Fruit cylindrical, sometimes round-
efore ripening, dark olive green and rather
when ripe dull yellow. Pips rather above the
size, prominent. Scales covering about one
part of the pips, and ending in a short blunt
Flesh white, firm, remarkably juicy, a little
but not highly flavoured. Crown rather large,
numerous and spreading.

en, *Barbadoes*, see Lemon Queen.

en, *Green*.—Spines large ; colour of flower
Form of fruit cylindrical ; quality best ; ave-
eight 2½ lbs.

en, *Lemon* (Lemon coloured Barbadoes, Bar-
Queen, White Barbadoes, Ripley's New
).—Easily distinguished by its leaves, which
oved or channeled, and the margins often in-
of a bluish green colour, with a considerable
ty of mealiness. Spines middle sized and irre-
Flowers lilac and large. Fruit cylindrical ;
ripening of a bright lightish green, when ripe
mon colour, and slightly mealy. Pips rather
the middle size and flat. Scales covering
one half the pips, ending in short points which
closely to the fruit. Flesh pale yellow, trans-
, very juicy, a little stringy, rather sweet and
t, although not very highly flavoured. Crown
size, often cockscomb-shaped ; generally weigh-

ing from three to five pounds; does not swell very readily during winter.

Queen, Moscow. Spines large; colour of flower lilac; form of fruit cylindrical; quality excellent; average weight 2½lbs.

Queen, Ripley's New, see Lemon Queen.

Queen, Purple Striped, see Striped Sugarloaf.

Queen, Ripley's. Spines large; colour of flower lilac; form of fruit cylindrical; quality best; average weight 2½lbs.

Queen, Silver Striped (Silver Striped, Gold Striped). Spines large; colour of flower lilac; form of fruit cylindrical; quality middling or bad; average weight 2lbs.

Queen, Striped (Striped Olive).—Spines large; colour of flower lilac; form of fruit cylindrical; quality second rate; average weight 2½lbs. Swells badly.

Ribbon Gross, see Striped Surinam.

Ripley (Ripley's, Old Ripley, Heaton House Montserrat).—Average weight 2½lbs. Leaves broad, rather long, and slightly recurved, dark green, much tinged with reddish brown, and mealy on both surfaces. Spines rather large, strong and irregular; margins reflexed and sometimes a little waved. Flowers purple. Fruit, roundish ovate, sometimes rather cylindrical, slightly compressed at either end; before ripening very deep green, and thickly covered with meal on the middle parts of the pips; when ripe of a pale copper colour. Pips rather above the middle size and rather prominent; scales covering about one-half the pips, and terminating in lengthened acute points. Flesh pale yellow, opaque, very sweet and rich, firm and crisp, not stringy, and of a very agreeable flavour. Crown about the middle size, leaves rather numerous and spreading. This was raised upon an estate called Ripley, in the Island of Jamaica.

Ripley, see Havannah.

Ripley, New, see Montserrat.

Ripley, Red, see ib.

St. Kitt's, see New Jamaica.

St. Thomas's, see St. Vincent's.

St. Vincent's (Green St. Vincent, Green Olive, St. Thomas's, Stubton Seedling, Bahama Sugarloaf).—Average weight 2½lbs. Swells well in winter. This has been described by Speechly to have leaves of the "same length as the Queen;" if well grown they will be found to be much longer, and differ only from the Green Providence in being narrow, less keel-shaped, and the upper surface paler green and rather more mealy. Spines middle sized. Flowers purple, middle sized. Fruit bluntly pyramidal, slightly mealy, and of a dull olive colour; when ripe of a dingy yellow. Pips middle sized, flat, and rather depressed in the centre. Scales covering nearly half the pips; the tops are short and adhere closely to the fruit, which gives it rather an even appearance. Flesh pale yellow, opaque, juicy, crisp, without much fibre, rich, sweet, and very highly flavoured. Crown middle sized, leaves rather numerous and slightly spreading.

Sans Epines, see Green Antigua.

Scarlet, Ananassa Bracteata, (Brazilian Scarlet).—Spines large; colour of flower dark purple; form of fruit pyramidal; quality middling or bad; average weight 4lbs. Only valuable for the beauty of its flowers. Leaves remarkable long and flat, rather broad and flaccid, of a yellowish green, often tinged with pale brown, and almost destitute of mealiness; spines very strong, far asunder and rather regular. Flowers large, dark purple, contrasting beautifully with the scales, which are of a brilliant scarlet at that stage of the growth. Fruit pyramidal, before ripening of a dullish yellow colour, on its approaching maturity it changes to a pale green, and becomes a little mealy; when ripe palish yellow. Pips small and slightly prominent, being half covered with the scales, which terminate in very long, broad, reflexed points, of a dull scarlet colour. Flesh very pale yellow, slightly fibrous, very juicy and soft, slightly acid, without much flavour. Crown large, leaves rather numerous and erect.

Semiserrata, see Havannah.

Sierra Leone.—Average weight 4lbs. Leaves long, broad and rather flaccid, with revolute undulated edges, of a clear bluish green, and, from the circumstance of its being a very free grower, often considerably blotched with a darker colour. Spines short, middle sized and regular. Flowers purple. Fruit cylindrical; of a dull green colour, tinged with red; when ripe, it gradually changes to a dull ochre colour, thickly covered with meal. Pips rather below the middle size and slightly prominent. Scales covering nearly one half the pips, and terminating in lengthened reddish coloured points; when approaching maturity it gradually changes to a dull ochre colour. Flesh very pale yellow, almost white, tender, abundantly juicy, free from fibre, crisp and melting, sweet without acidity, pleasant though not rich. Crown large and rather sweet, often accompanied by gills at its base, leaves numerous; it is also inclined to emit suckers at the base of the fruit, and those on the stem are inclined to fruit before the other is half matured.

Silver Striped, see Striped Surinam and Silver-striped Queen.

Stanton. Spines middle sized.

Stubton Seedling, see St. Vincent's.

Sugarloaf, Black. (Copper coloured Barbadoes.)—Spines middle sized.—Colour of flower black. Leaves purple. Average weight 3½ lbs. The fruit pyramidal like the other varieties of Sugarloaf; the colour is darkish purple, and slightly mealy before ripening; when ripe light orange. Pips rather above the middle size and flat, sometimes a little depressed in the centre, and covered to the extent of one-third by the scales, which end in a very short blunt point. Flesh very pale lemon-colour, rather stringy, very juicy, and sweet, with an agreeable pleasant acid. Crown rather large, leaves few and erect.

Sugarloaf, Brown.—Spines middle sized. Colour of flower lilac. Average weight 4lbs. The leaves of this variety are different from all the other Sugarloaves; in appearance they much resemble the Enville, but are less mealy and more tinged with brownish red; the fruit also bears a striking resemblance to that of an Enville, but is nearly destitute of mealiness. Flesh is rather firm, deep yellow, opaque,. without much fibre, very juicy, rich and highly flavoured, with a little acidity. Crown resembles that of an Enville.

Sugarloaf, Brown-leaved. (Striped Brown Sugarloaf, Mocha, Antigua Sugarloaf.)—Average weight 4lbs. Leaves rather strong, broad, somewhat keel-shaped, and slightly spreading, dark green, much tinged with purplish brown, rather mealy. Spines middle sized and regular. Flowers lilac. Fruit cylindrical, of a dingy green, and considerably covered with mealiness before ripening; when ripe dark yellow, inclining to orange. Pips large, slightly prominent. Scales covering nearly one-half the pips, and ending in short blunt points. Flesh deep yellow, rather opaque and slightly fibrous, not very juicy, but highly flavoured, and particularly sweet and rich. Crown middle sized, leaves rather numerous and spreading.

Sugarloaf, Bahama, see St. Vincent's.

Sugarloaf, Mealy-leafed. (White Sugarloaf, Dominica, New Mealy-leaved Sugarloaf, Allen's Seedling, Green Sugarloaf of some.)—Spines middle sized; average weight 3lbs. Flowers lilac. Fruit pyramidal, of a lurid green and slightly mealy; when ripe of a pale yellow, inclining to lemon colour. Pips rather below the middle size; flattish scales covering rather more than one-third of the pips, and ending in lengthened acute points. Flesh very pale yellow, almost white, transparent, rather soft and fibrous, sweetish without acid, slightly aromatic, not very pleasant. Crown small, leaves rather numerous.

Sugarloaf, Orange.—Average weight 3lbs. Leaves rather long and narrow, somewhat keel-shaped and a little spreading, of a dull green, considerably tinged with dark brown, and rather mealy; spines short, thinly set, and regular. Flowers, pale purple. Fruit, cylindrical; before ripening very dark olive, somewhat shining and slightly mealy; when ripe, deep yellow, inclining to an orange colour. Pips large and flat. Scales covering about half the pips, and ending in short, blunt, reflexed points. Flesh, pale yellow, almost destitute of fibre, very juicy, and sweet, with a rich highly-flavoured acid. Crown, middle-sized, leaves numerous and spreading. Raised at Blithfield, the seat of the Right Hon. Lord Bagot.

Sugarloaf, St. Vincent's, see Black Jamaica.

Sugarloaf, Striped (Purple-striped Queen, green-leaved with purple stripes, and spines on the edges; Green Sugarloaf, Green Striped Sugarloaf, Richly Striped Sugarloaf, White Sugarloaf, of some; Bird's Eye Bahama, Brown Striped Sugarloaf.)—Spines large; colour of flower pale lilac; Average weight 3lbs. Fruit pyramidal, as the other Sugarloaves, of a clear palish green colour, and rather mealy; when ripe, of a bright yellow. Flesh, deep yellow, semi-transparent, slightly stringy, very juicy, and sweet, with a slight aroma, but without much acidity. Crown middle-sized, leaves rather numerous.

Sugarloaf, Striped Smooth-leaved (Smooth-leaved Sugarloaf).—Average weight, 2½lbs. Readily known *by its leaves,* which are entirely destitute of spines, *and striped with* dull purple. The flowers are very pale lilac. The fruit pyramidal, as the other varieties of Sugar-loaf. Flesh, deep yellow, remarkably soft, with scarcely any fibre or acidity, a little sweet, but neither rich nor juicy. Crown middle-sized, leaves very numerous. This worthless variety originated some time previous to the publication of Speechley's Treatise, and seems now to be almost lost in this country.

Sugarloaf, White, see Mealy-leaved Sugarloaf.

Sumatra, see Montserrat.

Surinam.—Average weight 3lbs. Leaves rather narrow, long and slightly spreading, of a bluish green colour, a little tinged and slightly covered with mealiness. Spines rather deep and not very regular. Flowers, lilac. Fruit, cylindrical; of a dull green before ripening; when ripe, a deep orange and rather mealy. Pips roundish, middle-sized, projecting, and pointed. Scales covering about one-third part of the pips, and ending in lengthened reflexed points. Flesh, pale yellow, transparent, rather stringy, and very juicy, but neither sweet, rich, nor acid.

Surinam, Striped (Striped Silver and Pink Surinam, Silver Striped, Ribbon-grass, Prince of Wales's Island, Striped Prince of Wales's Island).—Average weight 2½lbs. This has been described by Speechley to exceed in beauty the whole tribe of variegated plants, not only in the leaves, which are beautifully striped with dark green and delicate white, tinged with a fiery red; but also in its fruit, which is cylindrical, and variously marbled with red, green, yellow, and white. Leaf spines small. Pips small, rather prominent, and covered to the extent of one-third by the scales, which terminate in narrow sharp points. Flesh, dullish yellow, very acid, and moderately flavoured. Crown middle-sized, of the same character as the leaves. Although a beautiful, this is a worthlsss variety.

Trooper's Helmet (Cockscomb, Hussar, Brown-leaved Java).—Average weight 4lbs. Very handsome. Leaves rather long, flat and erect, of a pale yellowish green colour, and mealy on the under surface. Spines middle sized and regular. Flowers purple. Fruit roundish, cylindrical; before ripening, pale green and rather mealy; when ripe, dark ochre. Pips large, flat, depressed in the centre and plaited round the margins. Scales covering half the pips. Flesh of a whitish colour, vey juicy and high flavoured, without sweetness or briskness, rather of a coarse and stringy nature. Crown large and spreading, leaves numerous. We have received it from Java, under the name of Java Broad-leaved and Java Narrow-leaved, and from St. Vincent's.

Trinidad (Pitch Lake).—Average weight 12lbs., said to weigh sometimes 26lbs. Leaves keel-shaped, very long and straggling, broad at the base, and tapering regularly to the apex, dull green, much tinged with brownish purple, particularly on the spines and inner leaves, under surface very mealy. Spines middle sized, remarkably irregular and growing in clusters, they are in the middle degree of strength, and thickly set. Flowers lilac. Fruit of an elongated conical form, the greatest diameters of which are in the proportion of 12½ inches in height, by 5½ inches in breadth; before ripening, dark olive, and lightly covered with meal; when ripe, dark orange, and slightly tinged with red on the lower part of the pips, which are large, of a roundish form, and only very slightly angular; the margins are rather elevated, with the centres depressed, excepting the lower part of the fruit, where they are a little prominent. Scales cover about half the pips, and end in lengthened acute points at the lower part of the fruit, but near the summit they are much shorter. Flesh pale yellow, soft, with little fibre, very delicate and highly flavoured. Crown very small, contributing, in continuation from the fruit, to give the whole the sharp termination of a regular cone. The leaves are reflexed, and considerably tinged with reddish brown.

Waved Leaved (Ananassa debilis).—Spines small. Colour of flower pale purple. Form of fruit oblong. Quality second rate. Average weight 3½lbs. Leaves large, flacid, spreading, wavy, dark green, slightly mealy above, and stained with dark purple; teeth reddish, small equal sized; the full grown leaves are about three feet long, and a well grown fruiting plant occupies a space of about three feet in diameter. Flowers pale purple. Fruit oblong, or tun-shaped; before ripening very dark green, when ripe dull yellow, with a greenish cast on one side; nearly destitute of mealiness. Pips projecting, middle sized, pointed as long as the scales, the uppermost of which are nearly destitute of a point, the lowest have a withered, deeply-toothed point. Flesh yellow, transparent, very tender, delicate, and juicy; flavour extremely pleasant, with a slightly perceptible acid. Core woody. Crown large, not disposed to become cockscomb-shaped, or to be proliferous.

Welbeck Seedling (Cockscomb, Crown, Prickly Providence).—This sort is readily distinguished from all others by its leaves, which are long, slender and spreading, broad at the base, and tapering to a very acute point; of a dull green and only slightly mealy. Spines large, far asunder and regular. Flowers small, dark purple. Fruit somewhat cylindrical, generally broader at the top than at the base; before, ripening dark olive; when ripe, pale lemon colour; very mealy on the centre of the pips, which are large, flat, rather wrinkled and depressed in the centre. Scales covering nearly half the pips, ending in short blunt points. The flesh is very pale yellow, almost white, semi-transparent, melting and juicy, slightly acid, with a rich agreeable flavour. Crown rather large, sometimes cockscomb-shaped, leaves nor very numerous.

Wortley's West Indian, see Black Antigua.

CHARACTERISTICS OF EXCELLENCE.

The perfection of pine-growing is not only obtaining them of a large size, handsome proportions, and full flavour, but in regular succession throughout the year. Upon the last circumstance we have no opinions to offer in the present section, but it will be a portion of that devoted to the culture of this fruit.

The characteristics of excellence are health and vigour in the plant, with a strong, bold shew of fruit, good height in the number of pips, strength of stalk, and the fruit boldly up in sight, the blossoming strong and of a dark colour, with a fruit swelling freely and quickly after every pip is perfectly well set; the swelling to be even throughout, without any deformity; and the crown proportionate, small and sturdy; colour, bright; and if the juice is oozing from the rind as thick as honey, and, when cut and handled, it is found to be much heavier than its apparent size betokened, and its flavour exquisite and superior, the specimen will be first rate.

Respecting the size of the crown, a pine plant will *never produce* one unsightly and unproportioned if some mistake has not crept into its culture. A Queen pine, in depth 12 pips, and fully 12 inches in length, with its pips swelled out evenly from stem to crown, and measuring from 18 to 20 inches in circumference, will weigh from 6 to 8lbs. A crown on such a fruit should be no more than 3 inches in length, and it should be rather sturdy and perfectly upright. We have swelled a Queen pine of 8½ inches in depth to the weight of 6lb. 4oz., with a crown on its summit only 2 inches high; the fruit was 22 inches in circumference, and nearly the same size at the summit as it was at its base. It is very possible that fruit, with nearly double the number of pips in depth, may at some future day be swelled out to a size in proportion to the above.

The Moscow Queen is a strong grower, and will, under good management, produce larger fruit than the other varieties of Queen. It is a very good variety, though generally considered not so high in flavour as the Queen, and lighter in colour. A well swelled fruit does not look well with a crown more than 3 inches in height.

The Black Jamaica is a superior fruit at all seasons. We have no better variety for swelling and flavour in the winter season. If it shews a fruit strongly, with seven or eight pips in depth, and is swelled out to the circumference *of 22 inches* by 9 inches in depth, *it is a handsome fruit;* and if the crown is managed in proportion, it should not be more than 3 inches in length. Such a fruit will weigh 7lbs. or more, if very full of juice.

The Green Olive is another superior winter-swelling variety. It does not produce a fruit very large, but good flavoured; is firm and heavy, weighing according to its size. The largest and heaviest cut at Bicton weighed 6lbs. 4oz.; the fruit was 10 inches in length and 17 inches in circumference; the crown was not quite 2 inches high.

The Enville is a handsome pine when of superior growth, and well proportioned from stem to crown. Its quality is coarser than that of the foregoing, and not so high in flavour; it requires to be eaten immediately after being cut, being apt to become insipid if kept even a short time. A healthy young plant has produced a fruit between 9 and 10lbs. in weight, 24 inches in circumference near the base, rather above 4 inches in length, and the crown not quite 3 inches high. It is not a fruit heavy in proportion to its dimensions.

The Old Globe is esteemed by some on account of its erectly-growing foliage not taking so much room as others of more spreading growth. It requires cutting as soon as it commences colouring, and to be hung up in a dry, airy situation, to perfect its colour. It must then be eaten immediately, or it will soon lose its flavour. Mr. Barnes has grown a fruit of this variety 7lbs. in weight, and but little more than 8 inches in length. It is a heavy weighing fruit if well swelled, and the crown, to look correspondingly, should be no more than 3 inches in length.

The Russian Globe will weigh 6 or 7lbs., or even more if well cultivated. The pips, if well swelled, are very flat, and, like the other black varieties, it requires to be eaten early after being cut, or its flavour will be much reduced.

The Providence attains a large size, and certainly has a noble appearance; but it requires much room, the leaves, if well cultivated, growing long, broad, and very spreading. If full vigour is supported throughout its growth, this variety will produce immense sized fruit, with pips very large at the base, and flat. A fruit weighing 12lbs. does not look disproportioned, if its crown is more than 4 inches high.

The sizes mentioned in the proceeding selection exceed the averages assigned to the several varieties in the alphabetical list we have given, but then the larger sizes have been attained under the improved mode of cultivation adopted at Bicton. Dr. Lindley is quite right in observing that a gardener was thought something of thirty years ago who could make his Queen Pines average 2lbs.; and a 2½lb. fruit was a prodigy. Moreover, *all those* men who continue to *follow the routine of* cultivation which was then adopted, obtain the same result, and yet they still fondly believe that they continue at the head of this branch of their profession. When they see announced that heavier pines are procured in various gardens, some of them doubt, others flatly contradict the statement, while a third section cry out at the injury occasioned them by such announcements. "Where are these gardens of Bicton," says one, "in which Queens average above 5¼lbs.?" He does not give himself the trouble to consult his map, which would have told him that they are near Sidmouth, and belong to Lady Rolle.

So far is pine-growing from having reached its acmé that it is the opinion of persons well capable of judging correctly, that we shall some day have Queen pine apples of 10lbs. weight. We do not think this improbable, for we can perceive no reason to the contrary, and much in favour of the expectation. In short, now that pine apples are treated like tropical plants, there is a chance for them to attain super-excellence; whilst, so long as gardeners persevered in docking their roots, the wonder was that the pines did not refuse to grow at all. (*Gard. Chron.* 1845, 815.)

With regard to the objection, that some gardeners, by growing large pines, injure those who grow those which are smaller, this can only happen, and justly, to those who will not do better. What a gardener *should do, is to* set before his master the relative expense of growing Queens to the weight of 3 or 4lbs., and 6 or 7lbs., and then to inquire which he prefers. In the majority of cases he would find his master preferring the smaller size, if well grown; because it is only on special occasions that very heavy pines are really wanted; and always to place on the table a Queen of 6lbs. weight, where one of only 3lbs. is required, would be unnecessary waste. There is, however, no family where pines are cultivated, in which to have the largest possible fruit, occasionally, is not a desideratum. If it were not so, the Providence and Enville pine apples, which have little but size to recommend them, would go out of cultivation. Again, the surplus pines, in many gardens, are regularly sent to market, and in that case it would have to be ascertained which is the most profitable, a crop of very large, or of middle sized, well-grown pines. And it is in this way that market gardeners probably view the question. They grow what best suits the market, and what will produce them the most profit. (*Ibid.* 1844, 131.)

We will remark, in conclusion, that if a pine apple is required to keep as long as possible, its crown should be removed, for the vegetation of the crown injures the flavour, upon the same principle that an onion or carrot is similarly deteriorated when it begins to sprout in the *spring*.

MODES OF PROPAGATION.

There is no doubt that the natural modes of propagating the pine apple are by seeds and suckers, but to these, the gardener's art has added propagation by the crown and cuttings of the stem. We have a strong opinion that, like other fleshy-leaved plants, it might be propagated, also, by leaves slipped off from the bottom of the stem.

Seeds.—The seeds are small, dark brown, not unlike those of the Siberian crab, and are contained within the pips or protuberances of the fruit. Mr. Speechley was of opinion, that its seed is rarely perfected either in this country, or even in the West Indies. The latter was certainly an error even when Mr. Speechley wrote, and under the better mode of cultivation now adopted, seed is also of very frequent occurrence in fruit ripened in this country. We can state this from actual observation; and moreover from similar experience, we think, that if practical men were to address themselves to hybridising the best varieties now in cultivation, we should very soon have others very superior even to their parents, and of a much hardier nature than any we have in cultivation at present. Three years ago, Mr. Barnes sowed three seeds of an Enville pine, given to him by Lady Rolle. They were sown in lightish turfy loam, mixed with a *little charcoal*, well drained in a 7-inch pot, filled to within an inch of the top. The seeds were placed near the centre, upon the soil, and covered 3-8ths of an inch deep with the same kind of soil, mixed with a little-charcoal dust and sharp sand, to prevent its binding. The pot was plunged to the rim, at front of the fruiting piries, in the stove, in a very moderate heat of barely 80 degs. at that time, and the atmospheric heat kept about 60 degs. or barely so much. The surface of the soil was covered with a bell glass. The seeds quickly vegetated, and the seedlings were above the surface like sturdy grass plants, in the course of twenty days from the time of sowing. They were pricked into thumb pots, making use of the same kind of soil, rather sandy and open with charcoal, the thumb pots placed each inside another pot, filled with porous rooty soil, and then plunged to the rim again in the same situation, under a bell glass; watering and giving air as they required it, dispensing with the glass altogether as they became established, and shifting them into larger pots when necessary. By the month of March, in the following spring, they were become sturdy plants, with leaves 5 or 6 inches in length, thick and fleshy, and were placed amongst the other succession plants. They differed materially from each other, and not one resembled their parent, the true Enville variety, either in countenance, colour, or habit, of plant or foliage. Each plant fruited *within two years and a half* from the time of sowing the seed, producing pretty, sizeable, well-swelled fruit, and were spoken of as being high flavoured, but differing in size and shape from each other; one only was of a pyramidal shape, similar to the Enville, but not in colour, and the other two were somewhat oval shaped. There was, at the time the parent Enville was in bloom, in the same house, some Queens, a Black Jamaica, and a Green Olive. We cannot account for the hybridising which certainly did take place, farther than the bee had free access at the time of ventilation.

Mr. Speechley's directions for raising seedlings are as follows:—The pots should be prepared and filled with soil to within one inch of the top, and plunged in a warm part of the tan-bed, a day or two before the seed is sown, that the soil may become heated. The seeds should be sown an inch apart, and covered to the depth of about a quarter of an inch. Place a piece of glass over the top of the pot, to which it should fit very close, or cover the whole with a small hand glass; this, by preventing the mould from drying, and giving an additional heat to it near the surface, will soon cause the seeds to vegetate. Neither air nor water will be required till the plants begin to appear, when a little air should be given in the daytime only; let the plants be sprinkled over with water every four or five days, in case the weather is fine and clear; but should it prove dark and moist, once in ten days will be sufficient. As the plants advance in size, a greater quantity of air should be given them in proportion to their progress, and by the time they have six or eight leaves, they will have strength to withstand the general air of the hot-house, and from that time will require a little water twice a week. The first leaves of seedling pines are very small and tender, much resembling the smallest blades of grass; the plants therefore should by no means be left uncovered till they have acquired strength, as the Onisci or Wood-lice (with which most hot-houses abound) would in one night destroy the hopes of the crop. It will also be advisable, when the glasses are first taken off the pots, to sprinkle the plants with water, and immediately dust them with a little snuff or tobacco-dust, which, being put into a puff, or small piece of gauze, may be thrown upon them with ease; a very small quantity will prevent those insects from injuring the plants. This method will also secure other young and tender plants, kept in hot-houses, from the like accident. By the end of August the Seedling pines will be grown to a proper size for transplanting, when they should be put into small pots filled with the same mould recommended for crowns and suckers; and from that time their treatment requires no difference from that of the others. (*Speechley on the Pine Apple*, 256.)

Suckers.—There was formerly a prejudice against propagating the pine apple from suckers, but this prejudice has departed, since finer fruit has been proved to be more easily attainable from them than from crowns, and that vigorously growing plants are those only which will produce it. Suckers usually and most readily produce vigorous plants. Always select the finest suckers, and from those plants only which have produced very superior fruit.

If a stool is not intended to be refruited from, as soon as its fruit is cut, take out the old stool, strip down the leaves, and cut off a piece of the stem or trunk with a hatchet or strong knife to the length of 3 inches or thereabouts, with a sucker or two growing from it. Do not usually allow more than two to grow on a plant; if it offers to produce more, twist them out carefully in a young state, but a strong healthy plant will not put forth a superfluity of suckers, unless subjected to extreme heat, cold, or the application of water to the axils of the leaves. Subjecting plants to sudden checks is the readiest method of producing a stock of plants. Plant immediately the pieces of stem in the pots, and the suckers will maintain their vigorous health almost unchecked; if care be taken in potting, and plunging of the pots afterwards, and attention paid to giving methodical syringing, or sprinklings with tepid water over *and about* the structure. The pots will be full of *roots within* 15 or 18 days, and will soon make *vigorous plants.*

The size of the pots for the suckers must be regulated according to their size. Most of the suckers at Bicton are at once placed into pots varying from 7 to 12 inches diameter; and the suckers have, usually, but one shift afterwards. They are not entirely confined to the one shift, but this is regulated by circumstances and seasons. At Bicton there is not the means of commanding a humid warm air sufficient for a bottom heat, therefore they are plunged in a very moderate bottom heat of fermenting materials, such as a little half-decayed tan or leaves placed on faggots: they put forth abundance of roots and grow quickly. Of course they should never at any season of the year be allowed to remain until potbound, or the roots in the pots become matted together; but always repot or shift when they require it, no matter what time in the season it may be. No month or season of year is unsuited for this operation.

From growing plants, not intended to be disturbed, suckers cannot with safety be taken till they are grown to the length of 12 or 14 inches, when their bottoms will be brown, hard, woody, and full of small round knobs, which are the rudiments of the roots. It would endanger their breaking if they were to be taken off sooner. When the suckers are taken off, the operation *should be preformed* with great care, that *neither plant nor sucker* may be injured. To prevent which, one hand should be placed at the bottom of the plant to keep it steady; the other as near as possible to the bottom of the sucker; after which, the sucker should be moved two or three times backwards and forwards in a sideway direction, and it will fall off with its bottom entire. Whereas, when a sucker is bent downwards immediately from the plant, it frequently either breaks off in the stem, or splits at the bottom. (*Speechly on the Pine Apple,* 260.)

Some, most erroneously, think it necessary to dry crowns and suckers before potting them, and for that purpose lay them on the shelves, &c. of the stove for a week or ten days. By this treatment, they certainly may be hurt, but cannot be improved, provided they have been fully matured before being taken off from the fruit or stocks, and that these have previously had no water for about ten days. They will succeed as well, or better, if planted the hour they are taken off, as if treated in any other way.

It is quite true that large suckers have been known to vegetate after lying in a hot-house unplanted during the six summer months, but this only proves their tenacity of life. Cut the base of the sucker smooth before planting.

Mr. Mills agrees in recommending the suckers to be planted immediately after separation from the fruit. He says, that planting crowns or suckers of pines in *pots, as soon* as removed from the parent plants, is doubtless better than drying them, as is sometimes practised. Pots proportioned to the size of the sucker or crown are best, namely, for small suckers, forty-eights; for ordinary sized suckers, thirty-twos; and for large ones, twenty-fours. It is good, at whatever season this potting is done, to plunge the pots containing the plants into a good lively bottom-heat of, say, 100 degs., with 70 degs. of top heat. Those who require ripe fruit every month in the year, will do well to plant suckers as often, there being on all suckers that are perfect, a quantity of embryo roots formed at the base, so that they may be detached from the parent, without risk, at any season; and if planted as advised, they will make roots freely; and if they do so, in either of the three months of winter, namely, November, December, or January, it will be best to raise the pots a little, so as to let them have at their roots about 80 degs. of heat, and at the top from 55 to 60 degs. of heat, with a good quantity of air; and when they have filled their pots with roots, that is, when the roots are sufficiently extended to prevent the earth falling from them on being turned out of the pots, the plant is in a good state to be placed in a larger pot. It is a bad practice to allow the roots to grow too long against the sides of the pot, as such roots frequently rot when the plant is placed in a larger pot. A pine plant may be shifted into a larger pot, at any season of the year, to its advantage, except during the three months before named. (*Mills on Pine Apple*, 27.)

The suckers emanating from plants when growing without pots, have nearly double the substance of those produced under the pot system, however well cultivated. Those suckers which are not ripe by the middle of September let remain on the plants which produced them until March following; for they are very apt to rot, not only when taken off very succulent, but likewise if taken off later in the season than September. Each plant generally yields from two to five or six suckers at a time. The season for propagation is according to the time the plants that are in fruit prduce the suckers; which is principally in June, July, and August, according as the plants are in forwardness; though the plants will grow at any time. It may however be observed, that they are always fit to be taken off for propagation, when they appear brownish at the bottom; they are to be slipped or drawn off carefully with the hand, (not cut) in a sideways direction. When they are taken off, they should be divested of a few of the lower leaves at the bottom, where they are expected to strike root; where they assume a brown colour at the bottom, and form little knobs, which are the embryos of future roots. These suckers being ripe, having had their full growth on the mother-plant, they should be planted directly into *pots (the first size)*, and plunged into the bark-bed in the nursery-stove. In cases where there is a want of plants, when the old plant produces ripe fruit, and no suckers from the bottom, as soon as the fruit is cut, trim the leaves of the old stools, giving them freely of water, and it will dispose them soon to send forth several suckers. (*Griffin on Pine Apple*, 35.)

Some persons indeed raise objections against those suckers that are produced late and near the roots, and call them contemptuously underground suckers. But they will produce as fine fruit as any other plants.

Mr. Hamilton's treatment of suckers is as follows:—

Suckers taken off in October, or November, plant into pots, from five-and-a-half to six-and-a-half inches diameter at the top, and plunge over head in the tan: this causes them to strike root in a very short time. In this state let them remain, without any water, except occasionally sprinkling them with the syringe, and this, in the winter season, only in the early part of the day. In March, transplant into pots from seven to eight inches at the top; and at this shifting, plunge up to their rims, in a heat of about 85 or even 90 degs. for a week or two after potting, to accelerate their striking root into the fresh soil. As soon as plunged, sprinkle them over their leaves with *water, two or three* degs. warmer than the atmosphere in the house; and this mode of watering ought to be repeated twice a day, in the summer season, except in very cloudy weather, when steaming the house will be found to keep the atmosphere and the plants sufficiently moist; but as the season advances, only water the plants over their leaves in the evening, at the time of closing the house, whilst the sun is still shining on the glass, and before its rays are much diminished. As soon as the heat rises in the tan, give a good watering at their roots, at this season, to settle the soil about them, but after this watering the soil ought to be kept sufficiently moist by watering the plants all over their leaves, every evening, after sunny days. About the latter end of May, again shift into larger pots, but at every one of these shiftings the bed must be replenished with fresh fermenting materials, as a brisk bottom heat is of the greatest importance for two or three weeks, after the plants have been fresh potted. If there is much sun at the time, shade the plants, rather than give much air, for a week or two after potting; but at all other periods they ought to have plenty of air. The size of the pots, at this shifting, ought to be from nine to ten inches diameter at the top. The plants are every way treated as before, well watered over their leaves, after bright sunny days; also plenty of water thrown on the pathways, or on the flues, pipes, &c. If the plants are intended to be turned out into the tan in the autumn, they may thus remain until the bed is ready for them, but if they are to be fruited in pots the following season, they ought to have their last shift early in August. The size of the pots required will be from eleven to twelve inches diameter at the top, and in order to grow the Queen varieties, as well as the Enville, to a large size, they ought to have their last shift ten or twelve months previously to fruiting. (*Hamilton on Pine Apple*, 64.)

On the potting of suckers, Mr. Dodemeade furnishes the following directions:—

He commences potting the strongest suckers early in March, the largest in twenty-four-sized pots, the smaller in thirty-twos, and plunges them in the pit as the potting proceeds, paying strict attention that the bottom heat does not rise too high. He preferred a bottom heat of from 80 to 90 degs., but never exceeding the latter, as he had found, by experience, that 100 degs. was dangerous, and 110 degs. had proved fatal, not only to fresh potted suckers, but to established plants. But little water is given till the roots reach the sides of the pots. As the weather becomes warm and sunny, it is applied more liberally, the water being about 70 degs. On fine sunny days, if the inside of the pit appears dry, a slight sprinkling of tepid water all over the plants and sides of the pit was found most beneficial, as a moist growing top heat of 80 to 100 degs. will facilitate the rooting and growing of the plants. A slight shading was found necessary on clear days. By the middle of May, if all goes on well, they require shifting, the largest plants into large sixteens, the smallest into twenty-fours, being careful to retain the ball entire. After shifting they are slightly shaded, and the house is kept close for ten days or a fortnight, after which, air is given early in the morning, on fine days, increasing it as the day advances. The thermometer should range from 80 to 90 degs. as it is necessary the plants in this stage should grow at railway speed. He waters with diluted manure-water. (*Gard. Journ.* 1845, 200.)

Crowns.—We never attempt to propagate by crowns, being quite convinced that it is an unnatural mode of propagation, and that if repeated during a series of years the size and excellence of the fruit would be gradually diminished. Plants, raised from crowns, are longer in producing fruit than others raised from suckers, and the fruit is more shallow pipped. Nevertheless, it is a mode frequently practised, and when crowns are employed we recommend that the part by which they were attached to the fruit should be cut quite smooth, and that they be planted immediately. In fact, as has been justly *observed*—

Crowns may be treated just the same as any other cutting, the base to be cut smooth, with a few of the under leaves picked off; and then to be planted in pots according to their size, and plunged into tan or leaves with a good bottom heat, placing them as near the glass as possible, keeping the pit moist, excluding the air, and shading during sunshine; little water is to be given till they make roots, when they should be gently syringed over the leaves, giving a little at the same time to the roots. (*Gard. Journ.* 1845, 141).

The cutting off the soft end that is twisted out of the fruit, prevents the bottom of the plants from rotting, for it remains to the last in the same state as it was when cut off. If employed for propagation, as the crowns are taken off daily during the fruiting season, as little time should be lost as possible in planting them. There is no necessity to use pots for them, but a hole may be made in the bark two or three inches deep, into which the plants may be put and made fast. When they have been a week or ten days in the bark, they should have a little water once every five or six days; they may be continued in rows, as they come to hand, planting them within three or four inches of each other; and if there are any crowns that are taken off during the winter months, they may be planted in the same manner. (*Griffin on Pine Apple, 33*).

Cuttings of the Stem.—All pine apples may be propagated in this mode, as a bud is formed in the axil of almost every leaf, and in the case of the Providence and other pines, which are shy producers of suckers, it is a mode of propagation often necessarily practised.

For the following directions we are indebted to Mr. Mills:—

Divest the stem of all its leaves, then cut it horizontally into lengths of two or three inches, according as the buds are situated; then split each length longitudinally down its centre, taking care not to injure the embryc plants in the operation; this done, let pots be filled to within two or three inches of their rims with soil well drained, and on this each piece is to be placed on its flat surface, with its buds upwards. The whole surface of the soil may be closely planted in this manner, and then let the slips be covered about one inch deep with heath soil, and receive a gentle watering (they should be kept in a moist state at all times); then the pots containing them should be plunged into a heat of 100 degs. Air will not be required until the plants show themselves above ground, which will be in three or four weeks, when they must have air as other plants. Each piece of the old trunk so divided emits roots freely, and the young plants also, when about two or *three inches above* the ground. When well rooted, if to be grown on the pot system, the young plants should be potted singly into forty-eights or thirty-twos, and on good bottom heat, and be near the glass to prevent their being drawn up weak, with a top heat of 65 to 85 degs. during the growing season, with plenty of air and moisture, and occasional shade. (*Mills on Pine Apple*, 72).

SOIL AND MANURES.

It is quite true that the pine apple will root and grow in almost any permeable medium. Mr Hamilton has employed nothing but undecayed tan for the purpose; Mr. Oldacre was equally successfully with powdered bones alone; and Mr. Brown, gardener at Merevale Hall, is strongly in favour of peat without any mixture. He says, those who have the good fortune to reside near good peaty soil need not be afraid of using it wholly in which to grow pines. For plants that are to fruit in winter, peat is excellent, on account of its loose texture. Pines planted in a mixture of half charcoal and loam, fruit very well. All sand gives no one cause of complaint; on the contrary, it should rather be recommended, for the roots become very strong in it, and the rootlets are extremely numerous. It *is not of much* importance what kind of *material pines are grown in*, provided the roots are in a healthy active state, and free from sudden changes of bottom heat. Mr. Brown gives the following as the results to young plants potted in August.

Sort.	Compost.	Description.
Globe	All peat	Grown well; excellently rooted
Queen	Sandy peat ..	Strong growth; excellently rooted
W. Providence	Loamy peat ..	Grown well; and well rooted
Queen	Half sand and loam......	Grown tolerably well; not very well rooted
St. Vincent ..	Peaty loam ..	Of fair growth; not very well rooted
Queen	All peat	Grown well; excellently rooted
St. Vincent ..	Half sand and peat	Grown well; excellently rooted
Queen	Rich loam ..	Excellent growth; but not so well rooted as those in peat
Queen	Sand and lime	Scarcely made any growth; and look very yellow.

(*Gard. Chron.* 1841, 503, 765.)

Now this may be, and doubtless is, all perfectl true; for there is no doubt that, with very assiduou attention to a due temperature, due moisture, and proper supply of liquid manure, pine apples migh be made to grow even in a mass of small shot. Bu then, in proportion as the medium employed for them to root in is of a sterile character, must the care attendant upon their cultivation be increased. Such extravagancies may be characterised as the art of growing pine apples with the greatest amount of *trouble.*

Although it is doubtless true that pine apples can be grown in almost any pervious inoxious medium, so is it equally certain that there are soils which they prefer, and in which they succeed best and most readily. It is so where they grow wild; for in Brazil the pine-apple is found near the sea-shore; the sand accumulated there in downs serving for its growth, as well as for that of most of the species of the same family. The place where the best pine-apples are cultivated is of a similar nature. In the sandy plains of Praga velha and Praga grande, formed by the receding of the sea, and in which no other plant will thrive, are the spots where the pine-apple thrives best. The cause of this lies evidently in the composition of the sand, which chiefly consists of salt, lime from decomposed shells, and a very little vegetable mould. Warmth, lime, salt, and moisture, seem therefore to be the principal ingredients in which the pine-apple thrives. Sand will take a very high and continued degree of warmth, being often heated by the sun so much as to scorch vegetation, and yet it seldom dries to a greater depth than from 8 to 12 inches. Sea salt is well known for its property of attracting the nocturnal damps, and retaining them a long time. The lime of the shells seems to be the principal manure, which has also been proved by the English in the Brazils, who, by manuring their pine-apples with a mixture *of powdered oyster*-shells with vegetable *earth, produce very large fruit.* The natural mould, usually slightly mixed with sand, is partly of a vegetable and partly of a mineral origin.

The treatment of the plants in Brazil is very simple. As the fruit ripens in January, the young suckers from the roots are taken off in April or May, and planted in the newly cleaned fields at a distance from 1½ to 2 feet from each other, and the strongest of them produce fruit in the following year, seldom weighing above 3 or 4lbs.; but those which do not fruit the second year, grow very large, and their fruit often weighs from 10lbs. to 12lbs.

In the Bahama Islands the pine apple affords still stronger evidence that it is not indifferent as to the soil in which it roots. The Hon. J. C. Lees, writing from New Providence, says, in those islands is a very red soil, in which alone the pine apple will grow. There are two other kinds of soil; one, a very white calcareous soil, consisting of chiefly finely pulverized Madrepore limestone, in which the maize or Indian corn grows remarkably well; and the other, a deep black soil, almost entirely vegetable, and very light, in which many things grow luxuriantly, but in neither of them will the pine apple grow at all. The red soil does not, as far as pines are concerned, appear to be improved by manure. Mr. Lees planted several in the same bed, some without manure, and others with *different* proportions of stable-manure; between those *in the natural* soil and those slightly manured, he could perceive no difference; but beyond this, in proportion to the quantity of manure, so did the plants decline and turn white. He tried plants in composts of charcoal and manure, and of charcoal, earth (calcareous,) and guano, but without success; nothing seeming to suit them here but their favourite red soil. Mr. Solly examined this soil, and says it is free from stones; and though it appears to consist in great part of a coarse ferruginous sand, on examination is found to contain no sand, being easily rubbed to an impalpable powder in a mortar, and showing no grittiness under the pestle. A portion of the soil, freed from the larger fragments of wood, roots, and bark, which it contained, gave an analysis of the following composition, in ten thousand parts:—

Silica	3090
Alumina	2400
Oxide of iron	1832
Lime (chiefly as carbonate)	132
Magnesia	8
Potash in a soluble state	5
Potash combined with earthy matter	20
Phosphate of iron	9
Sulphuric acid	2
Chlorine	4
Ammonia	a trace
Organic matter	990
Water	1508
	10,000

The soil is chiefly remarkable for the usually large proportion of oxide of iron which it contains, but in the absence of an analysis of the pine apple plant, no very accurate conclusion can be drawn as to the peculiar excellence of this earth for its cultivation. (*Hort. Soc. Journ.* i. 126.)

We find that in this country the best soil for the pine apple is a rough turfy loam, well sweetened and broken down. We prefer, above all, a heathy turf, with the roots and its natural vegetation all with it; never breaking it until at the potting bench, as the process of potting is going on. Then we break the sods, which are mostly chosen about two or three inches in thickness, in such kind of pieces as we can thrust into the pots, putting in, as we proceed, some pieces of charcoal, always taking care to drain the pots carefully, which is one of the chief essentials Our drainage is principally coarse charcoal, averagin one-fourth of broken rubbly potsherds, which ar placed first round about the bottom; then, if it is seven-inch pot, for a sucker, the drainage average two inches at least; and if fifteen or eighteen-inc pots, which are the largest fruiting pots we make us of, the drainage is employed in a coarser state, an about two inches more of it, and the soil too is thrus into the pots rougher—brambles, furze, heath, an grass, altogether—with no other kind of manur besides an occasional lump or handful of rubbl al, merely to fill up some of the crevices. *It rammed,* that is to say, not *pounded,* or jammed er in the same way potting is too often done, shed down as we proceed, quietly. Thus the really a whole body of drainage—there is no ction either to the atmosphere or the water. *on's Modern Gard. Dict.*)

Bicton the following mode of preparing the soil e apples from the top turfy spit of a common pted by Mr. Barnes. In dry weather during r, a naturally well drained part of the common ted, and the top layer is cut from it with all its herbage by means of a turf mattock. This turned upside down, with the soil side to the ce. of the sun and atmosphere for some days ry; it is then packed in cocks, as poor people turf to burn, to secure it from rain, and then home as quickly as possible, and placed on a tion of rough wood to the width of 4 feet, ; a quantity of rough wood between it as it is l, to prevent its fermentation, or the breeding gi, and to insure its entire healthiness until re- for use. It is stacked 5 or 6 feet in height, finished off in the form of a ridged or pitched which is at once thatched. To insure looseness ture, as every turf is taken from the stack for hard *blow or two is* given to it on the soil side. *done with a heavy* piece of wood of 2 inches diameter and about 2 feet in length, called at Bicton "the potting bench batten." The porosity thus secured, is of more consequence than may appear at first sight to some, who may imagine it a new-fangled system.

That a turfy loam is the best possible principle ingredient in pine apple soil, has been admitted ever since its cultivation attracted notice in this country. It is so laid down by nearly all writers upon the subject, but as they generally offer some instructive hints, we shall concentrate their directions pretty much in the order of time in which they appeared, warning our readers, however, against adopting those composts in which rich manures are prominently employed.

Mr. Giles, next to Mr. Justice, the earliest original writer in England on this fruit, says that the soil should be a rich hazely loam, taken from a well-pastured common, or what is called virgin-earth. Notwithstanding the directions given by several authors to make compositions of various soils, this answers much better, not only for pine-apple plants but for most other vegetables. (*Giles on Ananas,* 13.)

Mr. Taylor recommends one load of mould from under the turf of a good pasture, and, if it be very light, the fourth part of a load of good mellow loam to be added to it. But, if it be itself of a loamy nature, to mix with it two or three bushels of sea-*sand. Then* take the fourth part of a load of dung from a cow-yard, but, if not procurable, take the same quantity of good rotten dung from an old cucumber or melon bed. Mix these well together, and turn the whole three or four times. All the large clods should be well broken, but not sifted or screened. (*Taylor on the Pine Apple,* 14.)

Mr. Speechley, writing a few years later, says, in the month of April or May, let the swarth or turf of a pasture, where the soil is a strong rich loam, and of a reddish colour, be pared off, not more than two inches thick: let it then be carried to the pens in sheep-pastures, where sheep are frequently folded, which places should be cleared of stones, &c. and made smooth; then let the turf be laid, with the grass side downwards, and only one course thick; here it may continue two, three, or more months, during which time it should be turned with a spade once or twice, according as the pen is more or less frequented by the above animals, who, with their urine and dung, will enrich the turf to a great degree, and their feet will reduce it, and prevent any weeds from growing. After the turf has laid till the quantity of sheep's dung constitutes nearly one-third part, it should be brought to a convenient place, and laid in a heap for at least six months, (if a twelvemonth, it will be the better,) being frequently turned during that time; and after being *made pretty* fine with a spade, but *not screened, it will be fit for* use. In places where the above mode cannot be adopted, the mixture m be made by putting a quantity of sheep's or deer dung and turf together. But here it must be o served, that the dung should be collected from t pastures when newly fallen; also, that a larger pr portion should be added, making an allowance for t want of urine. 1. Three wheelbarrows of the abo reduced swarth or soil, one barrow of vegetable mou from decayed leaves, and half a barrow of coarse san make a compost mould for crowns, suckers, a young plants. 2. Three wheelbarrows of swarth r duced as above, two barrows of vegetable mould, o barrow of coarse sand, and one-fourth of a barrow soot, make a compost mould for fruiting plant (*Speechley on the Pine Apple*, 279.)

Mr. Griffin, writing in 1808, recommends the f lowing compost:—4 wheelbarrows of brown light pa ture loam, 1 barrow of sheep's dung, and 2 barro of swine's dung. He says that this compositio carefully and properly prepared, will answer for t growth of pine plants of every age and kind. should be well mixed, and broken small with a ba fork, so as to be well incorporated, and should fully exposed to the sun, air, rains, frosts, &c. to m liorate. It should be formed in a heap, not lar and high, but extended in length like a ridge, abo *four or* five feet thick. Once every two or thr *months, at* least, it ought to be turned over, and bottom thrown to the top, that all the parts may be well mixed. This is so peculiarly essential, that if the heap be not thus exposed, the compost would be far from effecting the proposed advantage to the plants. It is necessary that the above compost should remain a year in this heap or ridge. When you make use of this compost, it is not advisable to screen it for the pine plant, unless there are stones in it; but, in a general way, the soil should only be broken fine with the spade and hands; for, when fine screened or sifted, it becomes too compact for the roots of the plants. (*Griffin on Pine Apple*, 23).

Mr. Baldwin, who wrote in 1818, directs the pine cultivator to strip off the turf from old pasture or meadow ground, and dig to the depth of six or eight inches, according to the goodness of the soil, draw the whole together to some convenient place, and mix it with one-half good rotten dung, frequently turn it over for twelve months, and it will be fit for use. This is the only compost either for young or old plants. (*Baldwin on Pine Apple*).

Mr. Glendinning recommends a compost formed of turfy loam, of mould and fresh deer or sheep dung, forming them into a square heap in layers, putting three barrows of dung to six of loam and one of leaf or vegetable mould, and continuing to put the one after the other, until the heap is three feet high. No other preparation will be necessary, as it will be fit for use in three or four months, when, with a sharp spade, it must be cut through the heap perpendicularly, and the largest pieces again chopped. (*Glendinning on Pine Apple*, 20).

The soil *Mr. Mills* uses for pot culture is three-fourths strong loam and heath soil in equal quantities, and one-fourth fresh droppings of horses, kept dry in a shed, and mixed with the soil when required for use. The heath soil and loam are also used fresh and in a rough state, the grass only being picked out of them during the process of chopping; and about two inches thick of the surface of each. (*Mills on Pine Apple*, 45).

Mr. Hamilton says, let the turf be stripped off an old pasture to the depth of two or three inches, and add one-third of well decomposed dung from the stable yard, or from an old hotbed; to this may be added one tenth part of wood ashes. Let the whole be piled up in a ridge, and in a few weeks it will be fit for use. To those who have not these at hand, and are in immediate want of soil, the following may be used with great success:—Prepare a tank of liquid manure, into which throw your turf, and let it steep a few days or weeks if not wanted; then take it out and dry it under a shed, after which chop it with a spade, and it will be fit for use. (*Hamilton on Pine Apple*, 58).

Mr. Dodemeade says that the soil he uses for fruit ing plants is one-half loam, of a free fibrous nature, one-half fowl's and sheep's-dung, well incorporated. On Norwood loam, so highly thought of by some pine-growers in its vicinity, Mr. Dodemeade observes, that he had been told that no admixture of other matters with it was necessary; but if this statement was good in theory, it is denied in practice. Even the pine plants bear contrary evidence; grown entirely in this loam, they always appear of a yellowish green and of a stunted growth, indicating a want of stimulating matter. According to his own experience, Norwood loam only possessed one good quality favourable to pine-growing, viz., its soft unctuous nature rendering it open and free for the escape of water, and preventing it from binding hard, or cracking when used for potting; but unless stimulating substances are adopted for the plants to subsist on, and to feed the fruit, a person, he thinks, might as well expect to see an apple change to an orange as to cut a 4lb. Queen pine grown entirely in this soil. Then, again, the composition of this loam differs according to the situation whence it is dug, as is shewn by the following analyses of two, one known as Hamilton's loam, and the other the Woodman's Field loam:—

HAMILTON'S.

500 grains of this soil contain—

	GR.
Water of absorption .	21
Finely divided matter by filtration, principally alumina . .	72
Coarse alumina & sand	370
Soluble matter, mostly alumina	3
Carbonate of lime .	2
Oxide of iron	7
Loss	25
Total	500

WOODMAN'S FIELD.

500 grains of this so contain—

	GI
Water of absorption	32
Finely divided matter by filtration (alumina) . . .	16
Soluble matter (alumina)	1
Alumina and sand	410
Carbonate of lime	5
Oxide of iron . .	6
Loss	29
Total	500

Although these fields joined, there is this strikin difference in their component parts: Hamilton's loa is less retentive of water, but contains a larger amou of alumina (clay); that of the Woodman, less solub matter by half, but of coarse clay and sand a cons derably larger quantity; also a larger portion of lim with less amount of iron. The balance was prett equal as to their respective worth for pot use; if an difference, in favour of the Woodman, as regards lim and the retention of water; and that of Hamilton i the amount of soluble matter by filtration; but i neither was there any trace of vegetable matter hence, when used simple, the cause of pine plant grown in it being sickly and yellow. The soil Mı *Dodemeade* finds most adapted for suckers an *crowns consisted* of equal parts of good mellow loa and decomposed leaf mould. For succession plants he uses one-half good turfy loam and one-half leaf mould, decomposed cows' and fowls' dung well incorporated together. (*Gard. Chron.* 1845, 200.)

The practice of *Mr. Oldacre,* well known as gardener to the late Sir Joseph Banks, was very eccentric. At first, he used good sound loam and dung, with a little sand, when he found it necessary; but at the close of his life he grew his fruiting plants chiefly in powdered bones, in which he thought they throve better, and produced more highly-flavoured fruit. Mr. Loudon, however, was not able to discover any thing, in the appearance of either fruit or plants, to lead him to suppose that powdered bones are more congenial to the pine plant than good loam and dung; his plants were certainly not equal to Mr. Baldwin's, nor superior to those grown by Mr. Andrews, or Mr. Aiton. He, therefore, considered their thriving in this compost a proof more of the hardy nature of the pine, than of any thing else; and he had no doubt it would grow in powdered granite, or coal, or almost any powder, not even excepting gunpowder, if a due proportion of well rotted manure were added, and water, heat, light, and air, duly supplied. (*Loudon on Pine Apple,* 135.)

These opinions are coincident with our own, already expressed, and we will add here, having given the *directions of those in favour* of richer composts than we employ, that it is a bad practice to form heaps composts for any kind of plant culture, but partic larly for the pine apple. Composts thus heap together are apt to degenerate from the real healtl condition they were in when collected, and to becon altogether different in quality and influence upon tl plants. By the admixture they often become adhesi and compact, soured by fermentation, and the nurse of insects and fungi of various kinds. It is injuriou therefore, rather than beneficial to hoard up soils f a length of time, or mix composts long previously their being made use of: for the chief consequenc are to lose time and alter their most valuable prope ties. Liquid manure, when applied by the old scho of cultivators, was generally a composition of sever articles, recommended to be used only after it ha received so many stirrings, and had been allowed stand so many weeks or months, which just amoun to absurdity, and loss of time and of fertilizing powe besides, it never was recommended to be applied in clarified state, as nature applied it, but as a thic mixture admirably adapted to closing the pores the earth, under the old finely-broken soil syste of potting pines, besides causing a very unsightly a pearance on the surface of the soil.

The best liquid manure for pine plants in all stag *of growth* is made by adding one gallon of soot, on *bushel of* cow's, deer's, or sheep's dung, with a qu ter of a bushel of quicklime, into one hogshead of water; stir it well at the time of mashing; then once a day, for three or four days, strain it off into another cask, and drop another quarter of a bushel of quicklime into it, and it will very readily clarify. Of this, add one gallon to every two of soft water for applying to fruiting and fruited pines, always in a tepid state. For plants not in a strong growing condition, one gallon to three of water is sufficient. Always apply a small portion, at all seasons, to all pine plants in any stage that requires moisture, either by syringing over their leaves or by application to their roots, not at all confining them to clear water alone.

Growing in Moss.—As a further proof that Mr. Loudon and ourselves are right in thinking that the pine apple, with due cultivation, may be made to thrive in any medium unfertile to its roots, we will give the details furnished by M. J. Seimel, head gardener to Count Montgelas, at Bogenhausen, near Munich. Instead of soil he uses moss for the pine apples to root in.

Gathering the Moss, its Treatment and Mixing.—The moss (Hypnum spec. div.) is gathered in the months of September and October in the woods, and chopped small at home with a hatchet, or cut like chaff, after which it is laid up in a broad heap in the open air. About four English bushels of horn shavings, or more, are added to every two-horse-load of *moss, and well mixed with it;* after that the heap is left undisturbed till the following spring. In the first fine days of March, the moss thus mixed is spread in the air, in order to get it tolerably (but not thoroughly) dry; after which it is put under cover to prevent its getting damp again.

Transplanting the Pine Apples without Balls.—The pots are chosen in proportion to the size of the plants, but they are generally larger than when the plants are to be potted in earth. The apertures at the bottom are, as usual, covered with bits of earthenware, after which the pots are filled in the following manner:—First put in the prepared moss to the depth of three fingers, which is well rammed down, and then thinly covered with manure and salt, or saltpetre. This is continued alternately till the pot is rather more than half full; after which a cylindrical piece of wood, of from 2 to 3 inches in diameter (according to the stoutness of the plant), is placed upright on the moss in the pot, and the latter is then filled to the top with the same substance, with thin sprinklings of salt between the layers as before. The wood is then taken out, and the hole partially filled up with fine good mould. The number of pots thus prepared must be the same as that of the roots to be transplanted. (*Gard. Mag.* vi. 705.)

Pine apples grown in moss are not so sensitive as those which are grown in earth, and bear watering *better.* In the month of March put into a cask holding about two hogsheads, two bushels of cow-dung, one peck of horn shavings, and from 20 to 24 quarts of bullock's blood, filling the remaining space with water; and leave it for three or four months to a voluntary fermentation, causing the liquid to be well stirred up about once every week.

Use of the Liquid.—At the end of those three or four months the fermentation will have been completed, and the liquid may be applied to the pine apples towards the end of May or the beginning of June, and again in September and October, under the following regulations: When the moss in the pots has got properly dry, water the plants copiously with this liquid stirred up, and afterwards each plant with clean water, in order to distribute the former equally among the pots. Only use the liquid once, employing water at other times. Use this liquid again in September or October, also for once only, and then again use pure water. (*Ibid.*)

Manures.—These have been mentioned incidentally, whilst descanting upon the soil to be employed. If this be duly attended to, a little liquid manure will be the only fertilizer required. This is formed by adding a peck of fresh sheep's or deer's dung to 30 gallons of water, and allowing it to stand until quite clear. This may be given to all rooted plants once or twice a week; the stronger and more vigorous *the plants the oftener may* the liquid be given them

—they require and can elaborate perfe nourishment than weakly plants.

Mr. Glendinning, writing on this mode of says, that in order that a stock of liquid m be always on hand, it will be necessary to ha a couple of vats, or tanks, each holding o three hogsheads, according to the number cultivated; and that the liquid may be in a tion for use, it will be important to rene most exhausted every five or six weeks. Co fresh sheep or deer's dung, and fill a two vat about half full; then add about a peck o lime, and about the same quantity of soot; the vat up with water; this must be kept red every other day for a month, when it for use. When wanted, take an empty tub, a small meshed sieve over it; well stir the co and then pass it through the sieve. The i quality of this manure will require some mo so as to enable it to escape freely through t a small watering-pot; water must therefore until it is sufficiently attenuated to allow its When thus diluted, great care ought to be its application, not to let it fall on the lea plants; to prevent this, some simple contri be necessary, such as a funnel soldered on a long tin tube, into which the liquid can b *or a tube* made to screw on the spout of a s ing-pot, which will enable the operator to apply it immediately to the root of each plant, and thus avoid the unsightly appearance which they would have, were the foliage carelessly sprinkled with the liquid manure. (*Glendinning on Pine Apple*, 36.)

The liquid manure we employ is already described in a previous page.

Soot is recommended by Mr. Alexander, gardener at Carlton gardens, to be mixed regularly in the soil for pines. He says it is an excellent stimulant for giving those plants a dark green and healthy appearance. Used in the following proportions for fruiting plants: four wheelbarrows of friable turfy loam, cut three or four inches deep from a common or old pasture, at least one year old before using it, and to be turned and chopped two or three times during that period; one barrowfull of sheep's droppings gathered fresh from a common, and dried upon mats in an open shed, or out of doors, as the weather suited, and pounded fine with a quarter of a barrowfull of soot. The whole well mixed together, but not sifted, a week or two before being used. For succession plants, add two barrowfulls of leaf-mould to the same proportions. (*Gard. Chron.* 1843, 266.)

Soot, as a manure for pines, when used fresh, is also excellent for preventing worms from entering the pots: but the drainage *must be good*, otherwise it will soon *lose its volatility. If strewed* over the crocks to the *depth of a quarter of an* inch, it will answer the above purpose; the roots of the plants will grow freely in it, and their extremities will have a clear white and healthy appearance.

Salt.—In some districts near the sea, as in Brazil, and on soils not only strongly impregnated with salt, but actually flooded occasionally with sea water, pine apples grow to an enormous size. Hence, it is reasonable to infer that salt is assistant to the health and growth of this fruit, and we hope cultivators will try some experiments to confirm or refute this inference.

PITS AND STOVES.

WHEN pine apples are required all the year round, it is especially desirable that there should be two structures devoted to their cultivation; because, to obtain them in perfection, they must have a period of rest, and this can only be given to them in a temperature much below that in which their fruit is ripened. Moreover, Mr. Glendinning is right in observing that the pine plant in its younger stage, if supplied with the same degree of heat and moisture requisite to mature the fruit, has its foliage drawn, and the whole plant so constitutionally weakened, that nothing but disappointment would follow, the fruit of such plants being invariably puny.

In the winter months it is also desirable to keep the young plants comparatively at rest, and this requires a lowness of temperature not sufficient for ripening the fruit. At the same time, we must observe that, it is quite possible to make the structure we are about to describe quite efficient for cultivating the pine throughout every stage of its growth, if just attention be paid to ventilation.

Opinions amongst practical men vary respecting a fruiting pine structure, and we must acknowledge that, up to this time, we have not seen the kind of structure which we should like to have for this most essential part of pine culture. For convenience in watering, staking, removing plants, taking off suckers, and economy throughout, supposing a pit was erected 8 feet in width, in the clear between the back and front wall inside, this space would hold 4 rows of first-rate plants; the length, of course, must be regulated according to the number of plants to be fruited each season. If the entire pit be in length 100 feet, divided into four 25 feet compartments, each would hold 50 first-rate plants; by this means, of course, each compartment could be regulated as required at all seasons with heat, air, water, &c. &c., thus ensuring that great point, a succession of fruit. The walls of the pit should be of 9-inch work, but hollow, and tied together, of course, in places with a cross brick or bond timber. Throughout such a pit we would have a tank or gutter introduced for furnishing the required *bottom heat* and humidity, and such tank or gutter we would cover over with slate or galv iron closely, and on it have placed a good por charcoal in a rough porous state; over this, or up the centre, we would have a pipe run, with perforations thickly on each side, for turning o water, or water charged with ammonia clarified, requisite, for damping the whole surface of ch tank or gutter, to charge the interior with hu at any time when required. Over this we erect a platform on two rows of piers, by ca across galvanised iron bearers, each end of co take a bearing also, on both back and front and a cavity left between the top of the tank c ter and the bottom of the platform. This should not be less than from 2 feet to 2 feet 6 high; 3 feet would be all the better; first, b the air would not be liable so soon to become nant; secondly, because trap doors or vent could be placed to admit persons to clean o chamber between the platform and surface of the examine the whole, and replenish the charco other requisites readily at any time; and thir would be an advantage to have ventilators to with care the exterior air into the air chamb circulation over the whole structure. The b or sides of the platform should be constructed ¾ or 1-inch rods of galvanised iron. We say the because our plan would be to have a cavity round the outside of the platform, to the width of 3 inches, to admit of a free circulation of heated air and humidity just when considered necessary, by turning up the narrow ventilators, which should be placed over the outside cavity, and made also with galvanised iron, and hung upon hinges in about three lengths at the front or back of each compartment. The depth of the platform need not be more than 16 or 18 inches; if the latter, it would admit of 3 inches of rough charred materials placed upon the bottom; here the fruiting plants could either be turned out in a proper, or what may be considered a suitable preparation, or plunged in their pots. Possibly some practical men may imagine, were they to turn out plants into such a structure, they would like a greater depth of soil; but Mr. Barnes considers such a depth of suitable soil and drainage is quite sufficient, as it would readily allow a free circulation of air, water, and humidity, and would not be so likely to become soured as a greater depth would; and it is certainly a sufficient depth for placing the potted plants in, which should be entirely filled up between with charred vegetable matters in a rough rubbly condition.

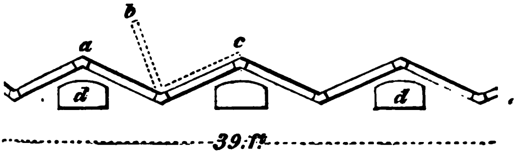
A four-inch flow and return hot water pipe should pass along the whole length at front of the pit; and the best known method adopted for giving air and covering, *keeping economy* as well as efficiency in view, We do not strictly confine our recommendation to the width mentioned, but it is a convenient width for the reasons named, and rendering each plant easily seen and come-at-able, and the lights are of a convenient length. The depth of the space between the summit of the platform and glass, should be about 4 feet 6 inches, as it is best at all seasons to have the plants near the glass, and the ventilation could be given to them in hot weather at both back and front, or entirely at front to any extent, which would considerably alter the angle of the structure and the power of the sun. This is a system we always practise for a few hours in the very hottest part of the day, which is far preferable to shading. Shading Mr. Barnes never practises, except for a few days slightly for fresh potted suckers, and plants fresh shifted for a day or two, if the weather happens to be fervent, for he considers it against all reason to practise shading to the extent some gardeners do in this comparatively sunless country.

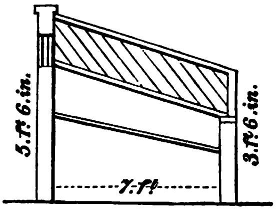
Where fermenting materials are abundant, and their unsightliness not objectionable, they could also be made use of with considerable benefit, by constructing the outside four-inch walls with pigeon holes, and leaving two or three rows of plug holes in the inside wall, to be opened or stopped when desired. The gasses from kindly worked fermenting materials, *says Mr. Barnes*, are not to be despised in pine culture, for they have no mean influence, and if well managed, there would be certain parts of the seasons when both tank and pipe heat could readily be dispensed with, or either one or the other, according to circumstances; it would be a grand point to have the full command when requisite of the whole, and if well managed, would grow pine plants and swell their fruit to an extent beyond all previous attainment. Of course such application of fermented materials could be confined out of sight, by building an outside wall or sinking a trench, if the pit or structure is a sunk one, (which is a practice we do not approve,) and it could readily be covered with shutters, which would form a platform to walk on to get at the pit more conveniently from the outside.

All the pitch that is necessary in the roof of a pine pit is just what is sufficient to throw off the rain-water that falls upon it. It is known that the pine apple plant luxuriates in a moist atmosphere; and, if that fact is admitted, there then can be no doubt as to a flat roof being the most conducive to produce that effect. On the contrary, if a dry atmosphere be required, by all means have the pitch or angle of your glass roof as much greater as is convenient, as there cannot be a doubt that the greater the angle of the glass roof is the greater will be the heat collected from the rays of the sun, and consequently the more arid *the atmosphere.* (*Mills on Pine Apple*, 4.)

Although we are in favour of hot water in pipes combined with fermenting materials as the best practical mode of heating structures devoted to the culture of the pine apple, yet various other modes have been proposed, from each of which we have selected that one which we consider the most preferable example.

Heat from Dung and other Fermenting matters.—This is the cheapest mode of heating, and, if combined with the following arrangement of the glass, proposed by that accomplished horticulturist Mr. Paxton, forms by far the most economical structure for pine-culture that has been devised hitherto. He directs the pits to be constructed of nine-inch brick on bed, 78 feet long inside and 7 feet wide being a good size. Cover the pit with a ridge and furrow roof, making the space from the ground in front of the pit to the valley-rafter 3 feet 6 inches, and the back wall below the rafter 5 feet 6 inches. Divide the whole length into four compartments, for growing the different sorts of plants, by 4½-inch brick-on-bed walls. Divide the whole length of the ridge and furrow-roof into 12 bays, having a ventilator in the angle of each pediment, as at *d d*. Now, to get to the plants, each light is hinged at the valley-rafter, and fastened with a thumb-button at the ridge-rafter. By referring to the following figure it will be seen that the light or frame leaves the ridge-rafter at *a*, in the direction *of b*, and lies flat upon the next light at c. Each light may be opened in this way, so that a workman may get to any part of the pit. (*Gard. Chron.* 1844, 69.)

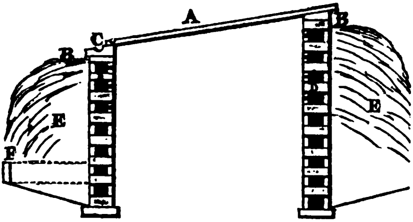




Mr. Knight's pit was also heated by dung heat only, but applied by means of linings. It was constructed of a hollow wall, nine inches thick, with sound, even-sized bricks, placed edgeways, the joints being carefully made, and laid with the very best mortar. The bricks placed with their faces and ends alternately to the outside, so that those which have their ends exposed become ties to the surfaces of the wall. In each succeeding course, as the wall is built, the bricks with their ends outwards are placed on the centre of the bricks which are laid lengthways in the course below. Thus a hollow space is formed in the *middle of the wall, of* four inches in width, which is

only interrupted where the tying bricks cr
there is a free passage for air from top to
the wall. The front wall is four feet, and
wall five feet six inches high, enclosing a sp
feet wide and fifteen feet long, and the wal
vered with a wall-plate, and with sliding lig
ordinary beds. The space enclosed may b
a proper depth with leaves, or tan, when it
to promote the rapid growth of plants. T
externally surrounded by a hotbed composed
and horse-dung, by which it is kept warm
warm air contained in its cavity is permitte
into the enclosed space through many smal
tions in the bricks. At each of the lower
a passage, which extends along the surfa
ground, under the fermenting material, an
nicates with the cavity of the wall, into wh
mits the external air to occupy the plac
which has become warm and passed into
The entrances into these passages are furni
grates, to prevent the ingress of vermin
kind. The hotbed is moved and renewed
successive portions, so that the temperatur
permanently preserved, the ground being
ascend a little towards the wall on every
the bed in shrinking may rather fall towa
from the walls. The perforations in the i
the wall are from 18 to nearly 20 inches di

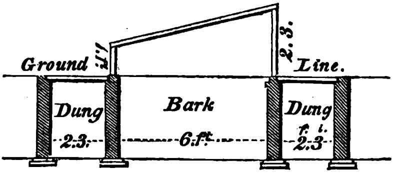
her, and they do not begin till the fifth row of from the bottom. When the pit is intended rly cucumbers or melons, and the lower part is juently to be filled with leaves or tan, the holes bricks should only be made above the surface iatever may be put into the pit, or, if previously e low, must be closed.



A, sliding lights; B B, wall plates; C, water-groove; D, Hollow wall; E, dung linings; F, air unnel. (*Knight's Papers*, 262.)

Mr. J. Macnaughten employs pits heated by tan, nd obtains additional warmth, when required, by the id of dung linings.

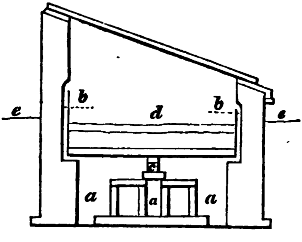
The pit is 18½ feet long, by 6 feet in breadth; the eight of the back is 5 feet; the height of the front feet 9 inches; the declivity for the glass 1 foot 3 ches. The pits for the dung are on the outside of e frames, and sunk level with the surface of the rth, or gravel, on the outside. The height of thes ts is 3 feet, their breadth 2 feet. The outside the pits for the dung is built with 9-inch wall the surface, with one course of heuri stone on th One inch is cut out for the boards that cover the allotted for the linings to rest upon: that appea of litter and dung, which is so offensive in orc hotbeds, is thus prevented. The boards that the dung are 1 inch thick, by 2 feet 2 inches in bre They are of the length of the pit, and have rin each end for lifting them with. The pits shou well drained, to carry off the under water, and a grate should be made at the end of them. The



of matter which is generally employed to fill the is a mixture of new horse and cow dung: some tree-leaves and short grass are used, which do very provided they be duly prepared, by throwing the in a high heap, to remain eight or ten days, that may ferment to an equal temperature. Let the be turned over once in the time. By mixing parts together they will work kindly when shaken the pits. The heat will be steady and lasting, at for a month. If the heat begins to decrease n *let a part, or the* whole, of the dung in the ba

front be thrown out and shaken back again, with a
ittle addition of new horse dung, and it will continue
s long again; only, let the pits be always kept full
p to the boards, and let only one side be shifted at
time, allowing fourteen days between shifting each
le of the pits. The inside of the pit is filled up to
thin three feet of the glass, with tanner's bark,
ll dried; for drying is a material thing to be at-
ded to in the winter season. Care must be taken
t to let any of the bark fall into the flue, or vacant
ce that is left for the heat to come up. (*Caled.*
rt. Mem. iii. 336.)

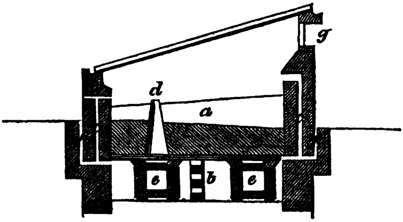
Fire heat direct.—Mr. Stewart, gardener to Sir R.
eston, at Valleyfield, near Culross, Perthshire,
cted a pit in which he built two flues (*a, a,*) and



pported over them, on brick props (*c*), a flooring of
ement, covered with layers of gravel and sand (*d*),
which he placed the pots; at the sides were open-
(*b, b,*) to admit the heated air from below to

warm the atmosphere of the plants; the upper of the platform on which the plants stand is n on a level with the external surface (*e, e,*). The of plants are set on the sand, so that when moi is added either to it or to the plants, it causes a gentle steam to arise through the whole of the which can be regulated at pleasure, by adding or less fire, according to the season or other cir stances. The temperature kept during the s and summer season is from eighty to a hun degrees through the day, and as low as from s five to sixty degrees during the night; in the aut and winter it is as low as fifty-five or fifty deg (*Hort. Soc. Trans.* v.)

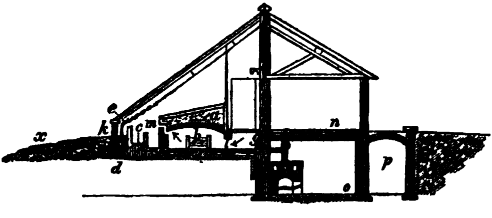
Fire heat and Fermenting materials.—A pin erected in the garden of W. Forman, Esq., is he by a flue in a chamber below the tan. The tan

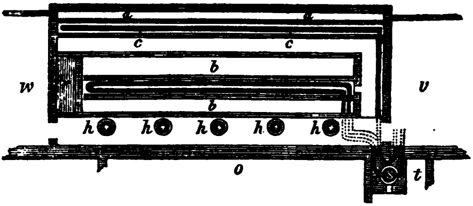


is supported by oak joints resting on the side *and on a* middle wall of open brickwork (b).

joists are three inches deep, an inch and a half thick, and three inches apart; instead of being covered with boards or tiles, a course of turf is laid over them, which is found to answer perfectly. The heated air is conveyed from the chamber below into the atmosphere of the plants, by means of small apertures (*c*,) formed in the back and front walls at four inches and a half apart, and also through tubes of iron, or chimney-pots (*d*), resting on the joists directly over the flue. Through the same pipes or pots water may be poured on the covers of the flues, which are formed hollow (*e*), so as to generate steam at pleasure. Ventilation is effected by air-holes (*f*,) communicating with the pit, and by sliding shutters in the back wall (*g*). (*Hort. Soc. Trans.* vii. 88.)

Hot water in Pipes.—The following plan is suggested by Mr. W. Henderson, of Walton Nursery, near Liverpool.





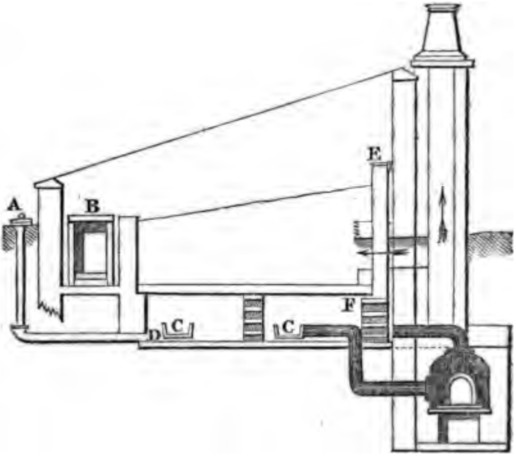
a, bed to plunge or plant out in; *b b*, hot air chamber; *c c*, gutter with pipes supplying heat to the atmosphere; *d d*, area where vines are planted and laid down during the season of rest; *e*, a closely fitted shutter is fixed here while the vines are laid down; *f* and *g* show an offset in brickwork which carry the back footpath; *h h h*, register gratings to regulate air to chamber (*b*); *k*, ventilators in front wall, regulated to admit or shut out air from the area (*d*); *b*, descending air cavity; *m*, ascending air cavity; *n*, floor of potting shed; *o*, cellar or root store; *p*, passage to ditto, which is an open area except where an arch crosses, forming entrance to potting shed (*n*); *r*, tank for water from the roof; *s*, boiler; *t*, stoke hole; *v*, a vinery; *w*, a plant house; *x*, a surface of vine borders. The pipes being laid in the gutters (*c*) will readily suggest the facility with which the atmosphere may be charged with moisture; or, on the contrary, when a dry heat *is desired, the* water has only to be withdrawn from one or either of the gutters just as may be deemed proper. The bottom heat to the plunging or planting out bed (*a*) is communicated through the brick arch from chamber (*b*). Brickwork is found to be by far the best medium, the porous material being a good conductor, as well as a guarantee that no accident can happen from over-heating the roots, while no difficulty will be found in raising the temperature of the tan or soil in the bed to 75 or even 80 degs. The pipes laid in gutter (*c*) are for supplying the necessary heat to the atmosphere of the house, and of course can be worked from the same boiler with, or independent of, the pipes in the chamber (*b*). You will at once comprehend that a rotary motion is given to the air in the house, a syphon action being formed by admitting the heavier, viz. the cooled, air at the register gratings (*h h h*), through the aperture (*b*), which, displacing the heated air in the chamber, escapes through the higher cavity (*m*); thus a constant circulation is kept up. (*Gardener's Journ.* 1845, 185.)

Another pine stove, heated by hot water in pipes, is at Bamford Hall, Rochdale, and is thus described by Mr. Cherry, its superintending gardener:—It is unequally span-roofed, the front rafters being 11 feet long and the back ones 6 feet. Its length is 25 feet, and its *breadth 15 feet, having* a walk 3 feet wide *round the interior.* It is fitted up with a shelf at the back, 3 feet from the glass, and with another in front, 5 feet from the glass. The front of the house is 6 feet high above the walk, and the upper portion is glazed to the depth of 4 feet. At both ends of the house there is a flight of 6 steps from the front walk to the back one, which is on a level with the front of the pit. The latter stands in the centre of the house, its slope corresponding with that of the roof; but instead of being heated by bark in the ordinary manner, the roots of the plants are warmed by means of hot water pipes passing beneath them. For this purpose the pit is surmounted by a boarded stage, containing 4 shelves, with openings in them to receive the pine pots up to the rims. Each shelf is 2 feet in width, and capable of containing 2 plants. The hot water pipes in the pit and those which warm the house are on the same level, and communicate with each other, so that only one fire is required. These pipes are all dished, for the purpose of holding water to create steam. The dishes in the pit are filled by means of one-inch leaden pipes, one end of which comes through the stage; and these are filled twice a day with hot water. There are also six small one-inch iron pipes, about eighteen inches long, which stand upright, and are screwed into the main pipes beneath the stage; the tops of these you can open or close, according as more or less moisture is required. The succession house is 25 feet long, 18 feet wide, and 12 feet high. One half of the stage is appropriated to suckers, the other half to year-old plants. It is capable of containing 30 year-old plants and 36 suckers. The suckers strike root more quickly on this plan than in bark. (*Gard. Chron.* 1843, 139).

At Thornfield, the stove in which Mr. Hamilton grows pines is also heated by means of hot water pipes. The wall is nine inches thick all round; the height of the back wall seven feet six inches, (from the trellis which lies close above the pipes,) to the glass. The wall at the ends and front is 18 inches above the pipes, at the top of the back wall. Under every light is a wooden shutter, nearly the width of the lights, and 10 inches deep, to admit air. These are opened from the outside. The length of the house inside is 28 feet, by 11 feet wide. The alley, which goes all round the house, and in which the pipes are placed, is 21 inches wide. The tan bed, which is surrounded by a nine inch wall, is 23 feet long by seven feet three inches wide; 3 feet deep at the back, and 20 inches at the front. Both ends of the house are glass. There are also twenty inch lights at the front, which are made to open, for the convenience of the operators. The whole roof is covered with nine entire and fixed lights, (no north lights,) and the laps of the glass are filled with putty. The pitch is four feet. The boiler is a half cylinder, and is fixed in the back shed, about

20 feet from where it enters the house. Although pipes are used, yet Mr. Hamilton recommends in preference the tank system. (*Hamilton on Pine Apple,* 98.)

Hot water in Gutters.—In a pit erected at Hewell, the seat of the Hon. R. H. Clive, of which pit the following is a plan, the bottom heat is supplied by hot water in gutters, and the air-heat by a common flue. Its length is 40 feet 6 inches; its width inside, 12 feet 9 inches; its height in front, above the ground, 1 foot 6 inches, and at the back 5 feet 5 inches. *A is an air pipe,* whose orifice is at the ground level,



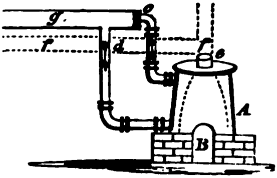
l which passes underground into a hot chamber, ered with wood, on which the pine bed lies. B is mooth flue, passing along the front from the fire- ace at one end of the pit, and discharging itself at e other end into an upright chimney. The shaded ne right and left of the section shows the ground ine; so that a large part of this pit is sunk into the ground. The other parts of the plan, which is drawn to a scale, speak for themselves. (*Gard. Chron.* 1843, 772.)

Hot Water in Tanks.—The boiler and apparatus for this are thus described in our former volume on the "Grape Vine:"—

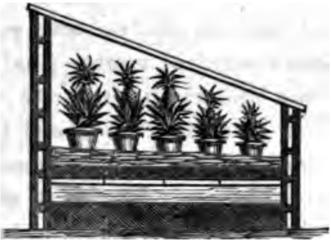
"Hot water in a tank is superior to the same source of heat in pipes, because it is not liable to freeze; and it is preferable to steam, because its heating power continues until the whole mass of water is cooled down to the temperature of the house, whereas steam ceases to be generated as a source of heat the moment the temperature falls below 212 degs.

"Mr. Rendle, nurseryman, Plymouth, the first successful suggester of the tank system of heating, has furnished us with the following particulars:—A tank of iron or wood, twenty feet long, five feet broad and six inches deep, is constructed in the centre of the house, and surrounded by a walk, except the end, where the boiler is fixed for heating it. T top of the tank is covered with large slabs of slate, cemented together, to prevent the excessive escape of steam. Around this is a frame sufficiently high to retain the bark, in which the pots are plunged. The boiler and tank are filled with water, and this circulates, when the fire is lighted under the former, by means of two pipes, one from the top of the boiler, and the other returning nearer to its bottom. The expense of piping, and danger of its freezing, is avoided; the fire only requires to be kept lighted for two hours at night, and again for the same period in the morning; the water, when once heated, retaining its temperature for a long time. In a small house the apparatus can be constructed for £5; and in all, for less than half the cost of hot water pipes. The saving in tan and labour is also very great; in some places tan costs 19s. per cart load, and where it is cheaper, the trouble and litter incident to its employment, and the dangers of loss from fungi and insects, of which it is the peculiarly fertile foster-parent, render it objectionable as a source of heat. And whenever the tan has to be renewed, the trouble and destruction of plants is always great.

"In the following sketch, for which we are indebted to Mr. Rendle—*A* is a transverse section of Roger's conical boiler; *B* is the fireplace; *g*, the tank; *c*, the flow-pipe; *d*, the pipe by which the water returns to the boiler; *e*, is the hole for the smoke, which, joined to a flue, *f*, can be made to ascend the chimney at once, or to pass round the house."



The following is the section of a pine pit to which the above apparatus is adapted.



It is described as a very useful and most desirable structure for the growth of the pine apple, with a hollow wall, recommended by all garden architects in preference to a solid wall—the heat or cold being not *so readily conducted* as through a solid mass of masonry. *Mr. Rendle* might have added, that hollow walls are also much drier. (*Rendle's Treatise on th Tank System*).

Hot water in Tank and Pipes combined.—This ha been done by Mr. G. Fleming, the excellent gardene at Trentham Hall. He says, in a pine pit recentl erected a Trentham, the tank system of bottom heating and that of hot water pipes for top heat are combined; and for keeping a sufficient and steady heat with a small consumption of fuel, nothing can b more satisfactory. The pit is seventy-seven fee long, and twelve feet wide inside, and is heated b what is called a saddle boiler. Under the bed ar four tanks, into which the water is delivered fron the boiler by a four-inch pipe, and after pursuing it course, is again received by another pipe. The advantage of two deliveries is, that the water no having so far to go does not get so cold before it i returned to the boiler, and the heat is more regula in all parts of the house. The depth of water i the tanks is about three inches. The tanks are mad of brickwork, coated with Roman cement. The are arched over with brickwork also, which i cheaper than covering them with slates; and b leaving interstices between the bricks, of which th arch is composed, the steam is allowed to escape, an penetrating the stratum of rubble above to keep th tan in a proper state of moisture. The same boi also supplies a range of four-inch pipe, which goes round the pit. There are cavities in the wall to permit the steam from below to pass to the top of the pit. The aperture to those can be closed at pleasure, thus insuring a perfect command over the moisture of the atmosphere. There is a chamber which formerly contained a flue belonging to the house that occupied the place of the one we are now describing. This chamber has been left with the view of its being useful for filling with hot dung, either for the purpose of assisting to maintain the heat of the house, or for destroying insects. The tanks and pipes cannot both be worked at the same time, but they are fitted with stop-cocks, so that either can be worked at pleasure; and a few hours in the middle of the day, when the pipes are not wanted, is found amply sufficient to keep up the bottom heat, as the mass of material, when once heated, retains its heat for a considerable time. *(Gard. Chron.)*

Stove for Pines, Vines, and Cucumbers, conjointly.—For the following directions in constructing this stove for joint-tenants we are indebted to Mr. Hamilton's little work on the Pine Apple :—

Build in a sheltered situation, but not to be shaded with trees, &c.; it should also stand to front the south, so as to have the advantage of the sun from *morning until night.* Where about fifty pine plants are intended to be grown, the length of the house ought to be about 28 feet, by 12 feet 6 inches wide inside, surrounded by a nine-inch wall; where the foundation is good, five feet will be high enough for the wall at the front and ends, which ought to be one foot above the ground level. The height of the back wall, nine feet; three apertures to be left about three feet from the top of the wall; they ought to be one foot high, and three feet wide, so that two vines may be turned out through each hole, in the winter, after their wood is ripe. They may be fastened along the wall, and if kept dry, will need no other protection; they may either all be in and started at once, or at different periods (and the apertures built up again), according to the owner's demand. The back retaining wall of the tan bed must be built on piers, leaving arches for the vine roots to pass through into the prepared compost underneath the pines. The piers will have to be nine inches thick; above which, a cavity must be left from the heated chamber to the top of the wall. The alley at the back ought to be at least three feet wide; end alley, 21 inches; front alley, 20 inches. The boiler must be fixed at either of the north corners of the house; it will require two flow and two return pipes attached to it; two pipes must be stretched along both ends and front, to heat the atmosphere in the house, and ought to be six or seven inches diameter. Each pipe must have a stop-cock near to the boiler, so that the tank or hot water flue may be heated without affecting the air in the house. The other two pipes from the boiler to be connected with the tank or flue, underneath the tan bed; they may be of smaller size, and a wooden plug must be formed, partially to exclude the hot water when the heat is too violent; and whether a tank or flue is to supply the bottom-heat, they must be chambered over; and if circulated in a flue, it may be eight or nine inches wide, and four inches high, and must pass all round the bed one-and-a-half feet from the wall, and may be lined with either lead or zinc, or plastered with Roman cement; it may be covered with flags. But previous to building the flue, the bottom of the bed ought to be filled two feet with compost for the vine roots; and flags or bricks laid all round, on which the flue must be built. A flue thus constructed will give plenty of bottom heat for the pines, and will keep the soil and other materials moist, under which the vine roots may be expected to grow rapidly; and in very cold weather the cavity in the wall may be opened, which communicates with the heated chamber, in order to maintain a sufficient heat for the atmosphere; and upon the chamber in the pit, must be placed 20 inches of the materials to plunge in the plants. The roof sloping to the north and south, as well as the upright ends, will have to be glazed, and all the laps filled with putty.

The north lights, which are about five feet long, will extend over the back alley, under which the vines are to be trained; the lights must be tilted up above the back wall when air is to be admitted. The materials in which the pines are to be plunged, may be sand, ashes, leaves, or tan; but the latter two ought to be preferred; and the plants may be occasionally turned out of their pots and planted therein. (*Hamilton on Pine Apple*, 100.)

Steam has been employed as a source of heating, but is now nearly abandoned, as being more costly and less effectual than hot water. The most wasteful way in which it was employed was by turning it into a bricked chamber beneath the bed; but, whether in a chamber or in pipes, it required much more attention than hot water needs, and with the disadvantage that at night it cools too rapidly to exclude an injuriously low temperature.

CULTURE.

To succeed in producing a first-rate fruit, all attendant circumstances must be accordant with each other. It is not the procuring the soil from the same *locality* that a successful cultivator does, that will *ensure success;* nor the harvesting of it, and taking care of it, after it has been well harvested; nor the right mode, or season, in making use of it; though all and each is a matter of some importance. It is not such a sized pot made use of for fruiting pines, with so much charcoal added to the soil; nor so many quarts of liquid manure applied so many times a week; nor a certain stated degree of either atmospheric or bottom heat; nor a certain time of applying, or degree of, heat, previously to giving air, or shutting up, that will ensure success; neither will any peculiarly constructed house, or pit; nor any especial heating apparatus; but all and each must be accordant with each other to insure success.

Pine culture is perfect when its fruit, excellent in quality, is producible in the dessert throughout the year. This is now accomplished in many gardens, thanks to the advanced skill and science of our gardeners, who have now exploded many detremental prejudices in the culture of this fruit—extremely high temperature and disrooting among them—which were fatal bars to first-rate quality, and continued succession. The employment of lower temperatures has gained to the pine apple that great requisite for excellence of flavour—slow but unchecked growth; for our experience is quite coincident with that of Mr. Knight, who says that he found all fruits (and particularly the melon) to acquire their highest state of excellence when their growth has been slow, provide it has been regularly progressive, and that the fruit has ultimately attained its proper size and perfect maturity. He thought, and thought truly, that no fruit has ever been so perfect, either in taste or flavour, the growth and maturity of which had been greatly accelerated by much fire-heat, and, of necessity, abundant water. He, therefore, inclined to believe, that the pine apple will be found to acquire its highest state of excellence, when a considerable time elapses between the period of its blossom and that of its maturity. (*Knight's Papers*, 260.)

In the summer time, Mr. Hamilton says, he can ripen fruit in from twelve to fourteen weeks from the time they show, so that both sucker and fruit is perfected at that season in seven months.

This is the greatest rapidity of growth consistent with excellence of quality, and pine apples allowed a month longer to attain ripeness, unchecked, and having the same exposure to light, would attain, probably, a higher flavour.

From twelve to eighteen months elapse between the time of planting a sucker and ripening its fruit; but when a succession of fruit is obtained from the same stool, three fruits may be obtained from it in two years.

Bottom Heat.—There is no truth more important to be kept in mind by the gardener, in his stove department, than that the temperature of the soil in which the plants are growing should be accordant with that to which their leaves are exposed. When we say accordant, we do not mean that the temperatures should be equal, but that the heat of the soil should stimulate the roots to imbibe nutriment just so fast as the temperature and light of the air enables the leaves to elaborate it. It is not difficult to find a rule for the gardener's guide on this point, for after numerous trials, both in this country and between the tropics, we find a close approximation to the truth to be, that the temperature of the soil ought to be just above the average of the temperatures to which the leaves of the plants growing upon it are subjected. Thus, if the pine apple grows in air, of which the extreme temperatures are 70 and 90 degs., the temperature of the soil in which they are rooted should be 81 or 82 degs. If the soil be heated solely by exposure to the air of the stove, this accordance of temperature is secured without trouble, but if there be a tank of hot water, or a mass of fermenting matter beneath the soil, great care is required, and great difficulties arise in the way of regulating the soil's temperature.

You may have the best of soil and water, but without bottom heat is very particularly and punctually attended to, great disappointments will ensue; there is more injury done by bottom heat than by all the other causes put together; and, in our opinion, this *was, in the first instance,* the means of giving them the character of being annual-rooted plants. Of one thing we are certain, that by misapplication, bottom heat has often been the means of depriving them of their roots, not only annually, but almost every time their fermenting bed got renewed; which sudden checks are the principal cause of their producing such abundance of weak suckers, and such diminutive fruit. To prevent those unnatural checks and disappointments, Mr. Barnes plunges the pots they are growing in not more than two-thirds of their depth, with an inverted pot for each plant to stand on (any ill-shaped old pots, or such as have a piece broken out of the side, or are cracked, &c., are always put by for this purpose), the fermenting material being always kept tolerably loose about them. Should the bottom appear likely to heat strongly, merely give the pots a move back and front with a strong stake, which causes them to stand clear, with a cavity in the bark all round them, to allow the heat and air to circulate freely; and when settled loosen the whole bed up between the pots with a small hand fork, and strong pointed stake for the same purpose. (*Gard. Mag.*)

Mr. Knight having so frequently witnessed the difficulties and the folly attendant upon enormous and unnatural bottom heat, was led to repudiate it altogether—that is to say, to deny the necessity of using *a fermenting* or other heating body beneath as a *medium.* Now, be it remembered that Mr. Knight gave little air and kept very high temperatures, especially when much solar light existed. By these means he obtained just what exists in nature—an advantage o a few degrees in the average of the bottom-heat ove that of the atmosphere. Therefore, it appears Mr Knight did not deny the propriety of bottom-heat but merely the capricious means by which it is generally obtained. Mr. Hamilton, after long practice during which he has met with extraordinary success also approves of what is termed a very moderat amount of bottom-heat; about 80 degs. in the summer, and not much more than 70 degs. in the winter Now, when we consider that an advantage of from to 5 degs. exists in nature, in favour of the averag temperature of the soil, as compared with the atmosphere; and that the average atmospheric temperatur for pines in a growing state, under glass in Bicton, i something like 70 to 75 degs., or even 80 degs., w must come to the conclusion that Mr. Hamilton' practice is perfectly natural. (*Gard. Chron.* 1846 726.)

We may as well detail here Mr. Knight's cours of culture, without bottom heat, as practised a Downton:—

The suckers were put into pots of somewhat mor than a foot in diameter, in a compost made of thi *green turf, recently* taken from a river side, choppe *very small, and* pressed closely, whilst wet, into pots; a circular piece of the same material, of about an inch in thickness, having been inverted, unbroken, to occupy the bottom of each pot.* This substance, so applied, affords efficient means for draining off superfluous water, and subsequently of facilitating the removal of a plant from one pot to another, without loss of roots. The surface of the reduced turf was covered with a layer of vegetable mould obtained from decayed leaves, and of sandy loam, to prevent the growth of the grass roots. The pots were then placed to stand upon brick piers, near the glass; and the piers being formed of loose bricks, without mortar, were capable of being reduced as the height of the plants increased.† The temperature of the house was generally raised in hot and bright days, chiefly by confined solar heat, from 95 to 105 degs., and sometimes to 110 degs., no air being ever given till the temperature of the house exceeded 95 degs.; and the escape of heated air was then, only in a slight degree, permitted. In the night the temperature of the house generally sank to 70 degs., or somewhat lower. At this period, and through the months of July and August, a sufficient quantity of pigeon's dung was steeped in the water, which was given to the pine-plants, to raise its colour nearly to that of

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* From Mr. Knight's recommendation of chopping the soil small, and pressing it together while wet, we entirely disagree. We find no plant thrive and root so readily, receiving the least possible check afterwards, as the pine apple does when potted or planted whilst the soil is in a moderately dry, friable condition. After which, it is beneficial to apply the requisite quantum of water, either to the soil or over the foliage, according to circumstances of season, &c. Besides, it would be necessary, if green grass were made use of, to employ some other composition to prevent the grass from growing. From this we also quite disagree, and should never think of putting it into practice.

† It did not seem to strike this great man how bottom heat *could be genially* modified, within the same structure, with little *trouble, and* economising the expense and labour at the same

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time; but depend on it, it will be found still a great advantage, in pot culture, to have the plants standing partly plunged on the platform in open porous sweet materials; and nothing would be so valuable for this purpose as charred refuse, which, by a proper application of moisture, would always give off, in the healthiest form, humidity, charged with ammonia; and the tank, gutter, or hot-pipe system of applying bottom heat could be managed similarly, with the same materials as previously recommended, and a perforated pipe for furnishing the requisite kindly humidity and warmth about their roots. We cannot see how Mr. Knight could obtain the circumstances afforded by nature, when his plants were placed on brick piers, and he admitted to them but little air, in an artificial structure, without any material applied to absorb the natural heat, and give it off charged with humidity, &c. This, however, would be accomplished by furnishing between the piers, or, which would be better, amongst the pots, a body of charred materials. It is *astonishing how quickly*, and to what extent, charcoal does *absorb heat, retaining* and giving it off in a genial manner.

porter, and with this they were usually supplied twice a day in very hot weather; the mould in the pots being kept constantly very damp, or what gardeners would generally call wet. In the evenings, after very hot days, the plants were often sprinkled with clear water, of the temperature of the external air; but this was never repeated till all the remains of the last sprinkling had disappeared from the axils of the leaves.

Mr. Knight deprecated giving pine plants larger pots in autumn; for the plants at this period, and subsequently, owing to want of light, can generate a small quantity only of new sap, and consequently the matter which composes the new roots, that the plant will be excited to emit into the fresh mould, must be drawn chiefly from the same reservoir, which is to supply the blossom and fruit; and he found that transplanting fruit-trees, in autumn, into larger pots, rendered their next year's produce of fruit smaller in size, and later in maturity. As the length of the days diminished, and the plants received less light, their ability to digest food diminished. Less food was in consequence dissolved in the water, which was also given with a more sparing hand; and as winter approached, water only was given, and in small quantities. During the months of November and December, the temperature of the house was generally little above 50 degs., and sometimes as low as 48 degs.

leners would have been alarmed for the
heir plants at this temperature; but the
uch hardier plant than it is usually sup-
e; and one young plant exposed in Decem-
mperature of 32 degs. did not appear to
injury; and in the east the pine-apple is
the open air, where the surface of the
rly in the mornings, shews unequivocal
a slight degree of frost. The plants re-
rly torpid, and without growth, during the
of November, and in the whole of Decem-
hey began to grow early in January, al-
temperature of the house rarely reached
and about the 20th of that month, the
r rather the future fruit, of the earliest
ne visible; and subsequently to that period
h was rapid.* This rapidity of growth, in
temperature, may be traced to the more

ving pine plants larger pots in autumn, we then,
es, shift and repot when the plants are considered
and indeed are very particular in giving all that re-
a good shift in autumn, to provide against the
of the weather proving unfavourable in winter;
ould as readily shift a pine at Christmas as at any
How is a quick growth to be made, and a suc-
iting plants to be kept up, if the succession plants
stand stationary in winter months? Indeed, the
tem of pine growing will not do in these railway
ld be quite impossible to maintain a succession

excitable state of their root, owing to their having passed the winter in a very low temperature comparatively with that of a bark-bed. The plants in winter were supplied with water in moderate quantities, and holding in solution a less quantity of food than was given them in summer. (*Knight's Papers*, 243.)

As the application of bottom heat is acknowledged to be one of the most important points in successful pine culture, we shall not be thought needlessly prolix in offering some more general remarks upon the subject, before proceeding to observe upon the management of some of the sources from whence it is usually derived.

As it is needful to keep up, or furnish, different degrees of heat and evaporation for fruit-swelling plants, and those in blossom, and those in earlier stages of growth, to continue a succession of good fruit throughout the season, just so is it needful to have a structure on a good principle, in compartments, with full command of means for applying an appropriately-heated humid atmosphere, or a dry atmosphere, as these stages of growth may require. These changes would be easily commanded by employing some one or other of the structures described in the last section. Thus, a tank, or gutter-heating

of good fruit throughout the season, if, during any part of it, *they were allowed* to be stationary, or nearly so.

apparatus, well constructed, the application of perforated pipes, or a shallow gutter added to the under pipe running in front of the structure, would furnish a command of humidity whenever requisite.

In our variable and dark climate it is found necessary to have at command a greater degree of bottom heat than top heat, particularly in the shortest days of winter; the same holds good for top heat in light arid weather; a full command of this essential should be at hand, and easy of command in both compartments, to assist nature whenever requisite. The system of obtaining bottom heat from fermenting materials, we entirely condemn for pine culture; the tank, or gutter system of bottom heating is equally objectionable, for placing the plunging materials on the top of the tank is obviously wrong in principle, and must also be a great waste of heat by absorption and confinement; besides its subjection to as sudden fluctuation as the old principle, particularly where the tank or gutter system is depended on, in a great measure, at all seasons, for heating the internal atmosphere as well. Every practical man must be well aware how subject the atmosphere, soil, plunging materials, and the whole interior of the structure, must be, under certain circumstances, to sourness, dryness, sudden stagnation, &c., upon such a principle in our variable climate. *We are advocates* for the heated air system *of applying both bottom* and top heat, when fully carried out upon correct principles, combined with economy.

At Bicton there is a pit for growing succession plants, in compartments of six lights; and generally some late pines in the season are fruited in one compartment. These are often started, bloomed, set evenly every pip, and have surpassed the swelling of those in the house or stove, which has been kept at night from 68 to 72 degs., with the assistance of hot-water pipes, capable of commanding any required heat, while those in the above pit have nothing more than a lining of well-wrought leaves, a little stable dung amongst them, and covered at top with dried short grass, placed against the wall to the top. But do not mistake the principle upon which this lining is applied to heat both bottom and top, because long practice in those matters has pretty clearly pointed out to us the simple principle is a good one, for furnishing a humid kindly bottom heat of warm air, also a kindly-heated humid atmosphere about the interior of the structure, to circulate among the plants. This pit was constructed by Mr. Barnes's predecessor, for containing the large body of three or four feet in depth of hot tan, for furnishing the then requisite bottom heat; and because there should be no mistake in the application of it, the pit, or rather walls of the pit, were constructed with pigeon-holes all round, to the height of three feet six inches, or thereabouts;

the pit and trench for the linings being sunk to the above depths, and shutters to cover the lining trench. Of course, this was intended for no other purpose than applying a still stronger bottom heat; this, to Mr. Barnes, appeared a reversal of the natural system. For the sun rays not only heat the atmosphere from above, but also the soil the plants grow in, in their native country. To alter the reversing custom, Mr. Barnes cleared out this large body of fermenting materials inside of the pit, filled it with wood and faggots to the height of the pigeon-holes, packed firmly together; on this he placed some old thatch and rubbishy straw, to prevent the little plunging material from running amongst the wood, which plunging material is about a foot of well-wrought sweet tan, which is forked up amongst each row of pots to about two-thirds their height, as lightly or loosely as possible; the arranging of each row of plants is carried on, the largest-sized pots are put on three bricks, placed triangular; and the others on two, each a distance apart, thus securing a healthy unobstructed circulation of heat, air, and water; for the tan is often hoed, or stirred over lightly with a long slender iron crook, fixed to a handle, which lightens and moves it nearly to the depth of the pots; the roots are always in the most vigorous, healthy condition; those, the fruiting plants, at this time *(May) are all over the tan,* from the side and bottom holes of the pots, and appear like a white net even amongst the wood. The linings are built up to the very summit of the pit all the winter, but not turned lower than the solid wall to the first row of pigeon holes: this answers the purpose of sun, or atmospheric heat from fire, by drying up the interna humidity throughout the dark short days, as the hea is principally thrown in *above* the plants and fermenting materials, which acts the part of both sun and fire heat in the most complete manner. As we gai light and solar heat, the linings are turned to the bottom, which is generally filled, all the winter, and tro in firmly, with dry leaves from the bottom to above the top row of pigeon holes. For the purpose o commanding a kindly humidity and heat throughou the interior, both at bottom and top, a cavity is lef at the side of the pit, and strait straw or brushwood placed against the top row of pigeon-holes to keep the cavity from being choked up, which can be moved or removed with little trouble, to admit of a free circulation all over the interior of the pit of heated humid air: it answers the purpose admirably. By some cultivators it has been recommended to cure an excess of bottom heat, by pouring about the fermenting materials abundance of water;—this certainly is a fai way of establishing one excess for the other. If it was performed in due time to save burning the roots by *its application*, the question is, whether oftentimes they did not suffer as much by the swampiness and sourness of the plunging material—besides, what system of regulation could be commanded under such circumstances, besides the extra loss of labour and sacrifice of property? No wonder at pine apples being considered annual-rooted plants under such an entirety of unnatural application of bottom heat—no wonder at Mr. Glendinning stating, that in the winter months the young plants must be kept stationary, or nearly so—no wonder, indeed, if they were to stand stationary, under such circumstances, when it was recommended to apply in autumn an extra supply of hot tan to carry them through the winter months, and deprive them at a certain time in spring of their roots; needful operations enough, no one could deny, under such unnatural treatment and circumstances. Thousands of pine plants in those days were forced and driven along with their long, narrow, thin leaves, with no other live roots to them during their whole existence, than the few they continued to form, as a matter of necessity, in the axils of the leaves; and if they then had been subject to the liberal airings and free ventilation we keep in practice, they would have been blown out of their pots. No wonder that shading should be recommended and adopted to such an extent in those days by the great pine cultivators—no wonder, indeed! But *on this we shall observe* more fully in our next volume.

Our system is always to keep the surface of the soil and plunging materials pretty moist, by frequent syringings in fervid weather; and by keeping a quantity of rough lumps of charcoal spread about the surface, a genial vapour is at all times in circulation, particularly in sunny days, when it is most requisite.

We will now furnish some directions for the management of some of the sources from whence bottom heat is usually obtained.

Tanner's Bark, if employed as a source of heat for the pine apple, requires very constant attention to preserve it from injurious vicissitudes of temperature. Fresh bark should always be had for this purpose, not more than a week or ten days, or at the most three weeks, out of the tan-pit.

Tan, when it has undergone a good and regular fermentation, for a period of about four weeks, if kept from excessive moisture, has a sort of charm for the growth of all plants that are natives of warm climates. When it is to be used as bottom heat, it will be advisable to keep it in a dry shed while in a state of fermentation; and it being full of moisture when taken out of the tan vats, it will require no additional moisture while in a state of preparation for the growth of pine apples, or any other exotic. The time required to bring it into a sweet state will be about four weeks. Three or four turnings will be *necessary*; and during the operations of turning, let the middle of the heap be turned outside, and *vice versa*, this treatment will bring it into a fit state for the purpose of growing pine apples, and it must not be used until it has undergone that length of time in its preparation, and has acquired a black, decaying state. If white and mouldy, it must be well watered, and left a few weeks longer until its moist decay is established. If leaves are used in place of tan, they will require about the same time and attention to turnings to bring them into a sweet state; they should also be in a moderately moist state, viz., between the two extremes of wet and dry. (*Mills on Pine Apple*, 50).

The pine apple plant succeeds best when the heat in the tan or leaves is so strong as to admit of the pots containing their roots being plunged into it only a few inches, say half their depth; at which depth the heat should be bewteen 90 and 100 degs.*; and in this heat, supposing it to be moist and sweet, the plants will make great progress if well rooted, and if not, they will make roots very rapidly if in their growing season, viz., from February to the end of October. When the pit has been filled with fresh plants about six or eight weeks, the tan will probably have become somewhat dry within about a foot of its surface; which will be readily ascertained by withdrawing the watchstick. This is a stick thrust into the tan, which, on being removed and grasped in the hand, where it had been immersed, will readily give the state of heat and moisture with sufficient accuracy. If the bed should be found dry, the plants should be taken out of it immediately, and the tan should be soaked with water, sufficient to make it quite moist.

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* This heat will not raise the temperature of the soil in the *pots to more than from 80 to 85* degs.

Bark should not be very large or small; as the first is apt to heat too violently, and the other soon becomes mere vegetable mould, and ceases to ferment. It should be moderately dried before it is put into the pit, otherwise it will cake and heat too much; it should also be turned over, and lightly shaken up, in order to bring it to a proper temperature. Previously to plunging the plants, it is necessary to screen all the bark in the beds annually, that the fine parts may be separated from the coarser, the latter being still fit for use; for if new bark be added to old that is much decayed, without screening, it will not be sufficiently porous enough, and will therefore burn. When the old tan is screened, that part of it which is fit for use again should be spread of an equal thickness all over the pit; then bring in a sufficient quantity of new tan to raise the bed to its proper height, which should be full three feet thick; and with a fork stir up the *bark from* the bottom of the pit, mixing the new and old well together; which, if properly performed, will continue a moderate heat for four or five months. The best season to screen the bark is in the month of September; for the beds will be put into a good condition for the winter. When these beds begin to decline in heat, some new bark should be added, to renew it again. Many gardeners place their new tan in the beds in layers, and plunge the plants in old bark on the top of the new; but this method cannot promote the welfare of the plants so much as when the bark is screened, and the new and old mixed well together; for the fermentation is not so moist when the pots are plunged in all old bark; and when it is all new at the bottom, the roots are apt to be burnt by the bark heating too violently. (*Giles on Ananas*, 8.)

Mr. Dall, gardener to the Earl of Hardwicke, at Wimpole, uses, and recommends, for the more safe and expeditious manner of filling tan round the pots that are partly plunged into the bark-bed, as here stated, a pipe or funnel made of sheet-iron; the mouth that receives the tan is 15 inches, and the lower end four and a half inches diameter, with two handles fixed to it, so that the operator easily holds it while a lad is filling in the bark from a flower-pot. (*Hort. Soc. Trans.* vii.)

Oak Leaves are often employed as a substitute for *tanner's bark in the pine* stove. In districts where the oak abounds they are cheaper than bark, and, properly managed, they yield heat more permanentl After being raked into heaps, the leaves shoul immediately be carried to some place near the ho house, where they must lie to couch, there to fenced round with hurdles, or any thing else, to ke them from being blown about the garden in win weather. In this place tread them well, and wat them in case they happen to have been brought dry. Make the heap six or seven feet in thicknes covering it over with old mats, or tarpaulin, to pr vent the upper leaves from being blown away. a few days the heap will come to a strong heat. L them remain in the heap for five or six weeks, which time they are properly prepared for the h house. In getting them into the pine pits, if th appear dry, water them again, treading them layers exceedingly well till the pits are quite fu Then cover the whole with tan to the thickness two inches, and tread thoroughly till the surface b come smooth and even. On this place the pine po in the manner they are to stand, beginning with t middle row first, and filling up the spaces between t pots with tan. In like manner proceed to the next r till the whole be finished; and this operation is p formed in the same manner as when tan only is use After this, the leaves require no farther trouble t *whole season* through, as they will retain a const and regular heat for twelve months, without either stirring or turning. (*Speechley on the Pine Apple*, 304.)

Surface covering for the tan, or leaves, is desirable not only to preserve them in a more regular state of moisture, but for neatness. A covering of sand, three inches deep, excludes insects from harbouring in the bed, but moss has the best appearance.

END OF VOLUME I.

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GARDENER'S MONTHLY VOLUME.

THE PINE APPLE;

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,
Author of "The Dictionary of Modern Gardening," "Gardener's Almanack," &c.; and
JAMES BARNES,
Gardener to Lady Rolle, Bicton, Devonshire.

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THE PINE APPLE.

CULTURE—(*Continued*).

Temperature of Air.—There is no well-grounded doubt that the pine apple is a much hardier plant than is usually supposed, and we have ample evidence demonstrating that it will not only endure very high, but very low temperatures, and that it will flourish and be fruitful when growing permanently in temperatures much below those usually assigned for it. Our conviction upon this point cannot be shewn more decisively than by our having commenced, without any previous communication, experiments to test whether this fruit cannot be grown out of doors in Devonshire, and in a greenhouse in Hampshire. Mr. Knight found that a young pine apple plant endured without injury a temperature as low as the freezing point of water; whilst to try its endurance of the other extreme, Mr. M'Phail found it could be plunged in water heated to 130 degs. without being *prejudiced.*

To ascertain this point decisively, he filled four vessels with hot water. The water in the first vessel was 130 degrees hot, that in the second 140, that in the third 150, and that in the fourth 160. Into each these vessels he put a few pine plants, divested of their fibrous roots, and suffered them to remain in the water about an hour. The plants which had been immersed in the water heated to 140 and 150 degrees, were a little hurt at the extremities o their leaves, but after being dried in the hothous they were planted, and grew as vigorous as if the had not been put into hot water; the plants put int water 130 degrees warm were not in the least injured but those put into water heated to 160 degrees we entirely destroyed. (*M'Phail.*)

Another excellent authority, one very conversa with the capabilities and habits of the pine appl Mr. Mills, gardener to Baroness Rothschild, at Gunnersbury Park, quite agrees with us on these point observing that the pine apple is by no means the tender plant that it is by many supposed to be. It w live, if kept moderately dry, in the low temperatu of 34 degs.; still it is not advisable to keep it so cold any length of time, and it requires from 45 to 50 degs. during the months of November, December, and January, in which temperature young plants will progress that are not intended to fruit the following summer; and even for these, the temperature may be increased in summer 10 or 20 degs. with benefit. All larger plants should be kept at a higher temperature, say from 55 to 60 degs., and during the short intervals of sunshine an increase of 20 degs. will be highly advantageous, particularly when the young fruit is in blossom, and even 80 degs. in winter, from sun heat, if only for a very short period. It is by no means necessary to keep them in a uniform regular temperature, but to let it vary according to the external air; it is good to let them have comparative rest in very dark, dull, cold weather.* It gives them vigour, and they then feel the turn of the season to greater advantage; whereas, if forced into growth in winter, it is at the expense of the strength and health of the plants; the leaves elongate without firmness, and they become yellow for want of light. Plants so treated can never be made good afterwards;

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* Although it is by no means necessary to keep pine apple plants in one uniform temperature, yet we cannot agree with the stand-still system, during any period of their growth. In the short days of winter we continue our plants' progress, though not with midsummer rapidity, yet steadily and strongly, with a robust fleshy foliage and strong roots. This is fully maintained at Bicton, by applying the heat by linings from the top part of the back and front walls of the pine pit, and less humidity from the bottom; by the application of abundance of air daily, but mostly at night. We are in no fear of dampness injuring the plants, or of their becoming weak, drawn, or *yellow.*

as their constitution or organization has been deranged, and the plants have become quite debilitated. Young plants will do well in high temperature, say from 80 to 85 degs. sunheat, with plenty of air and moisture. The pine plant, when in a fruiting state, and also when swelling its fruit, is not benefited in the summer by a heat exceeding 90 degs. with sun; 80 degs. is the best heat for swelling the fruit, and although it will swell much faster in a heat of from 100 to 120 degs., it will not come to so great a weight when grown in high temperature, as it would do if kept in one not exceeding 80 degs. (*Mills on Pine Apple*, 9.)

This leads us to the inquiry, what is the best temperature for the pine apple? We are always best answered if the reply to our queries can be obtained from nature; and the reply, therefore, to the above query shall be from observations made at Calcutta. In the vicinity of that city, the yellow-fleshed pine apples are high-flavoured, and commonly weigh between 5lbs. and 6lbs.; and M. Speede, in his "Indian Hand-book of Gardening," says (p. 183), that by a system of very ordinary cultivation, his brother grew them weighing 7½lbs. This was, of course, when the plants were exposed to a climate of which the following table shews the monthly averages of temperature, taken at the hottest and coldest periods of the 24 hours. Now, although pine apples may be obtained nearly all the year at Calcutta, yet their period of greatest perfection is from April to September. This may be termed their ripening or stove period; and it will be found, upon referring to this table, that the average maximum temperature of that period is above 91 degrees, and the average minimum more than 79.

	TEMPERATURE.	
	Maximum.	Minimum.
January ..	84·5	60
February ..	90	65
March	90·5	71
April	97	77·5
May	95	78·5
June	91·5	81
July	88	80
August.. ..	87	80
September ..	90	80
October ..	91	75
November ..	85·5	64
December ..	81·5	57

We may just observe that the above are average temperatures, and that the pine apple in Bengal often has to endure such widely differing temperatures as 129 and 53 degs. From these facts, we conclude that if in England the temperatures each month never ranged higher in the pinery than the minimums in the above table, they would not be too high in proportion to the diminished light of our latitude.

The following are the night temperatures aimed at by Mr. Glendinning, and we are of opinion that are full 5 degs. too high, not only from our owr perience, but because the day temperature sh differ full 10 degs. above that of the night. W confirmed rather than shaken in this opinion by Glendinning's observation that—

Allowance must be made for sudden transitio the external atmosphere, or any such cause w may influence the air of the internal apartment few degrees up or down; this variation, unless great and unnatural degree, will in no way affec general health of the plants.

MONTHLY TABLE OF NIGHT TEMPERATURE.

	Pit.	Stove.
January	54	65
February	56	68
March	57	71
April	59	73
May	60	75
June	61	76
July	62	78
August	62	78
September	60	76
October	58	73
November	56	69
December	54	65

(*Glendinning on Pine Apple*, 52.)

We quite assent to the reasonableness of gro *the succession* plants in a temperature unif about 12 or 14 degs. lower than that employed for the fruiting plants; and Dr. Lindley scarcely expresses his opinion upon this point too strongly.

We do not agree, however, without some qualification, to the opinion that plants which grow fast when young never carry good fruit. That they are subject to debility if allowed to make rapid growth, under some systems of management, is certainly true; but there are exceptions to this rule, under certain circumstances, or how are we to produce a robust plant by the growth only of a few months, and produce fruit from it, of surpassing excellence, within the year? To perfect a fruit alone, after its first appearance, in first rate condition as to colour, flavour, and extreme weightiness, according to its size, would take, or should be allowed to take, the time of from 16 to 18 weeks. We are in no fear of debility in its constitution, or of its organization being deranged under a correct system of applying heat, air, water, and humidity of atmosphere, at any season of the year; and we cannot countenance the stand-still system. Slow, but still continued, growth is quite another thing, and must be adopted at some seasons of the year. Thus, no one now would think of applying the same amount of heat and moisture to any plant in short dark days as they would in the bright, hot, and *dry days of summer.*

With this qualification we agree with Dr. Lindley, that the first, and we apprehend the most essential, circumstance, is the growing plants slowly at first, and rapidly afterwards. It is a certain law in vegetable physiology, that plants which grow fast when young never carry good fruit. It is, indeed, impossible that they should: for how can we expect vigour in old age from debility in youth? and rapid growth when young is inevitably attended by debility. Plants grow fast, but acquire no solidity. They are like children who shoot up at once into the stature of manhood, and immediately afterwards perish of consumption; or they may be likened to those fungi which are formed in a day, and rot in an hour. This truth is just as applicable to melons, strawberries, peaches, and vines, as to pine apples.

If, says Mr. Glendinning, the pine-apple in its younger state is supplied with the same amount of heat and moisture as are required in ripening the fruit, the foliage will become drawn and slender, and the whole plant so constitutionally weak, that nothing but puny fruit could be produced. In fact, this agrees with the natural habit of the pine. For in the tropics it grows in the cool season and fruits in the hot season, and there is scarcely less than 16 deg. of difference between these two periods. For instance, at Nassau, where the Providence pines are found, the difference is from 14 to 15 degs.; and in some parts of India, it amounts to as much as 30 degs. It is true that these variations of season are not applicable when pines are several seasons before they fruit; but then very fine pines are always produced on young plants, for the whole of whose growth two seasons—the cool and the hot one—are sufficient.

Mr. Hamilton, gardener to F. A. Philips, Esq., of Thornfield, near Stockport, and one of the best of modern pine cultivators, is equally decisive in his opinions as to the variations of the temperatures, during the different periods of the plant's growth. He says that the heat required for succession plants ought to vary according to the season. In the winter, when they are not growing much, 55 to 60 degs. will be sufficient; but from March to November, 70 to 80 degs. during the day, and 65 to 70 degs. at night. (*Hamilton on Pine Apple*, 67.)

In the fruiting stove he recommends the maximum heat of the house in November, December, and January, by artificial means, not to exceed 60 degs., the minimum 55 degs. In spring and autumn, if fruit are to be swelled, maximum by sunshine 80, minimum 68, medium by artificial heat 70 degs. In the summer, the maximum, under the effect of strong sunshine, may rise to 90 degrees, and may be allowed to drop as low as 70 degrees in the morning. In very bright, sunny weather, Mr. Hamilton says, the plants in fruit *had better be shaded*, than have admitted to *them too much air* at any time of the day. From this recommendation of shading we entirely dissent, considering it to be one of the most incorrect practices in modern pine culture. In this country, where we have so much gloomy weather, and consequent deficiency of light, there is never such an excess for any plant that is a native of the tropics as to render necessary shade when it is established, or its fruit swelling. It is a recommendation not it accordance with the dictates of nature, though such a recommendation was very necessary in those by-gone days, when pine plants were cultivated almost without roots. We condemn the shading system altogether, for plants of any age which are established with roots. Applied to fruit, or fruiting plants, it must certainly occasion a considerable sacrifice of their best qualities. A far more correct principle is, instead of shading, to secure in fervid weather a genial humidity to the interior atmosphere. We are fully aware that shading was in full practice among cultivators of the pine years ago, but considering the poor rootless system then adopted, and the parching, unkind interior atmosphere, and the fine, soured compost employed, undoubtedly shading was then necessary, to keep upon the plants even a slight degree of green colour; otherwise they would have had a more seared, lean, narrow-leaved appearance than they then had. *Instead of shading*, let the pine-grower secure a regular *and constant* circulation of moist air in the interior of the structure, as previously directed. By this method the plants will always maintain a dark healthy green; have stems, stout and well rooted, with leaves short in proportion, wide and fleshy, and well able to shew, and swell off fruit of the first quality. In order to swell this fruit to a large size, no air ought to be given until the thermometer reaches 80 or 85 degs., which will generally reach that point in the morning, by nine or half-past. To keep it down to this, give it the benefit of air, until half-past ten, then close the house, and water them over their leaves; thus let them remain until half-past two or three in the afternoon; letting them have all the benefit of light and sun. At half-past four, close the house, syringing again over the leaves of the plants, which will keep them moist during the whole of the night. (*Hamilton on Pine Apple,* 90.)

Newly potted plants will be benefitted by a heat of about 90 degs. for two or three weeks; after which time it may fall to 85 maximum, and 80 minimum, but in the winter, 75 degs. will be sufficient. The bottom heat required for those plants which are to produce several fruit from the same plant, ought to be as equable as possible, at a medium of about 80 degs., and not to fluctuate more than 3 degs. above or below; however, a plant will swell well in the summer, in a bottom heat of 70, but in the winter, when the superincumbent atmosphere is kept cooler, the plants that are swelling their fruit will make little progress, except the bottom heat be about 75 degs. (*Hamilton on Pine Apple*, 92.)

In a more northern latitude, and consequently diminished duration of light, slightly lower temperatures ought to be employed than in those we have mentioned, and in accordance with this we find that Mr. A. Smith, gardener to Col. Paterson, of Cunnoquhie, N.B., states that about February the temperature is raised by him to 70 degs. during night, and about 65 degs. in the morning. In May, or when the flowering is over, the steam is frequently admitted to the atmosphere of the pit through the whole night. This seems to destroy insects, and to keep the foliage of the plant in a state of fresh and healthy verdure. The temperature is now about 75 or 80 degs., and steam is applied when artificial heat is necessary to maintain that degree of heat, which, in very warm weather, is only about once or twice a week. (*Cal. Hort. Mem.* iv. 573.)

Shading—Necessary as it is to expose the pine apple to a duly regulated amount of heat, and a free exposure to light, yet they both may be admitted in excess. Night naturally brings a refreshing period of rest, but it is also beneficial to relieve those plants from the effulgence of the mid-day sun which *are not fully* rooted, and more slightly during their *blooming, for* there is not a plant when in blossom that is not prolonged in vigour by being shaded from the sun at noon. Impregnation is thus better secured. Nor should shading be attended to merely with regard to the blooming plants. Every plant transpires at a rate great in proportion to the elevation of the temperature and brightness of the light to which it is exposed; the greater the transpiration the more abundant is the absorption of moisture; and the moment the roots fail in affording a supply equivalent for the transpiration, the leaves flag, or become exhausted of moisture, and if this be repeated often, they decay altogether. Shades properly managed, prevent this injurious exhaustion.

It is but fair to state that Mr. Barnes dissents from the recommendation of shading the pine apple even whilst in bloom. He says, "shading pine plants, although necessary under former systems of culture, in my opinion, is now loss of time, and injurious to the plants rather than beneficial. Maintain a kindly humidity, correspondent with the admission of air, and then no shading will be required to a pine plant after it has made roots. Shading, then, when in bloom is entirely opposite to my own ideas. Above all other times, I delight in seeing plenty of sun light upon a pine when it is in blossom. This will not only induce it to open its blossom vigorously, but to attain a dark beautiful blue borage colour; fructification will *be vigorous, and there* need not be the least fear of deformity or debility. If showing fruit, and blossoming in short days or in gloomy dark weather, the blossom is naturally weaker, of a lighter colour, fructification is not so vigorous, and the formation of the fruit is more liable to malformation. These are practical facts, and must be well known to every observing gardener. Be assured that if a pine plant of any age or size, well established, with healthy roots, and placed so that the roots may be maintained fully in a vigorous condition by the application of the other requisites methodically, there is no more need of shading it than there is for shading an old forest *oak*. Shading moderately certainly is requisite for fresh potted suckers, or occasionally, a short time, for newly potted, or planted out plants; but, generally speaking, for the latter even I do not practise shading, but apply a little extra humidity. The quick progress the plants will make managed methodically upon this system is astonishing; there is no stand-still about it."

Mr. Hamilton is more friendly to shading, and states that, various experiments have led him to believe that partially intercepting the rays of the sun for a few hours in the middle of very bright days, and occasionally dewing the plants in fruit in the early stages of their growth, does not injuriously affect the flavour of the fruit, provided that water is *entirely* withheld three weeks previously to the time that the fruit changes colour. The Providence, Enville, and Antigua, he never waters nor shades six weeks after they have bloomed; and such as the Montserrat, Jamaica, &c., he does not water after seven or eight weeks, as these sorts are longer in ripening. So rapid has been the growth of the three former varieties, that the fruit frequently measured from 18 to 21 inches round in that time, and increased in weight from 16 to 20 ounces per week. Very justly he endeavours by artificial means to surpass a tropical climate, by imitating a moist and dry atmosphere in the same house, and at the same season. This he accomplishes by so arranging the plants that he can sprinkle and shade those that are growing, whilst those that are maturing their fruit have the benefit of all the light and sun; and thus he effects one of the most important objects of pine culture, namely, encouraging rapid growth in one set of plants, whilst others are ripening their fruit. By thus deviating from a natural climate, he manages to cut at least eleven months out of the twelve; whereas, if he was to imitate entirely a tropical climate, the fruit would be all produced at one particular season. In his opinion, wherein we fully coincide, the flavour does not so much depend on a scorching sun as on the health and vigour of the plant. (*Gard. Chron.* 1844, 372.)

Mr. Glendinning entertains a similar opinion, entirely concurring with us in thinking excessive light injurious to the pine apple. He says, some shade, of a partial kind, is necessary, in clear and scorching sunshine, which prevents that brown ferruginous hue, by some so highly lauded, and certainly preferable to a yellowish green; both extremes are alike objectionable; shade, therefore, given and removed at the proper periods, will be of the utmost service in preventing extraordinary evaporation, and thereby promoting the rapid and luxuriant growth of the plants, and securing to them that dark green colour, which is the aim of all first rate cultivators of this exotic. Upon this recommendation, Mr. Barnes observes, "I entertain a decided opinion that the light we receive in this country is never to that excess, that well rooted, healthy pine plants, or those in blossom, or swelling their fruit, ever require any shading at any part of the season. Have the structure for their cultivation so arranged that the front of the lights can be tilted with ease, to any required height, if found necessary, in very clear scorching weather; thus altering the angle of the structure, applying the requisite humidity throughout the most fervid parts of the day, or all day, if found requisite; making use of the engine or syringe freely in good time of an afternoon, to apply abundance of clear tepid water, mixed with a quart or two of clarified manure water, *and occasionally* clear soot water, all over the plants,

urface of the soil, or plunging materials, and walls
f the structure; all this will maintain a favourable
nd kindly humidity both night and day, and no
hading will be required under such circumstances.
hus treated, a growth vigorous and rapid will be
uickly established and maintained. As to 'a ferru-
inous hue,' no such objectionable appearance will
ver be observed if the system I have recommended is
aithfully carried out. There need be no fear what-
ver of any depredation from insects, as such treat-
nent will quickly scourge them, let them be ever so
umerous. Respecting grape vines being introduced
nto a pine structure, I condemn it altogether. No
nan, under such a combination, can do entire justice
o either one or the other. The shade from the vine I
m perfectly convinced is injurious to the pines. What
s gained by one is loss in the other, and neither
ery often will be of first-rate quality. I am for se-
arate structures, to do justice to each."

Being an advocate for shade to a limited extent,
ven to the fruiting plants, Mr. Glendinning does not
ject to grape vines being trained up, and confined
the rafters of the fruiting-house, but, on the con-
ary, would prefer them as a useful, ornamental,
d economical screen. One great evident advantage
ising from shading the young plants, when the day
oves clear, and the foliage has been moistened in
morning, will be the prolongation of a damp

growing atmosphere; and the heat, likewise, moderated by a plentiful admission of air, will prove in fact the desideratum during the influence of powerful atmospheric heat; for without some sort of shade, the withering effects of a summer's sun would soon become but too apparent, by deteriorating the colour, and collapsing the foliage. The young plants must not be matted up as in protection from frost; the direct rays of the sun should be intercepted; but only some very thin mats laid lengthways, or otherwise; some slight bunting, or nets very close in the mesh, would answer the purpose exceedingly well. (*Glendinning on Pine Apple,* 42.)

Every stove should be furnished with outside rolle blinds to its roof, and these, if made of wide-meshe canvass, will modify the light when necessary, wil check radiation and consequent cooling at night, a well as be an efficient guard to the glass in case o hail storms.

Moisture in the Air.—A chief atmospheric characteristic of the tropics, is its extreme moisture. B day, the air, owing to the intense evaporation, i saturated with watery vapour, and this bathes agai every plant at night, when the air by cooling cann combine with so much vapour, and this is, consequently, deposited in the form of heavy dews. T keep pine apple plants healthy, and, consequentl *free from* insects also, this moistness of atmosphe *must be* secured to them.

At Bicton, the paths of the pine stoves are deluged with water, many times daily, in clear fervid weather. They have perforated pipes, so constructed all round the fruiting pine structure, that they can turn the water on the whole or part, at back or front of the structure, and both ends, at any desired time. It is so constructed that they can turn on a very strong power of water, and entirely deluge the whole structure in a few minutes, or they can ease it down to the softest dribble, or in single and very slow drops; and this is at all times in full command. Copper pipes are employed, placed in union joints, by which means, with a single turn, the water can be made to spray over the whole surface of the walls of the structure, or the paths or the heating apparatus, either in part or over the whole.

If tan or other fermenting mass is within the stove, this yields much moisture, but nothing nearly sufficient; and to increase the amount, the paths should be deluged with water at least twice daily; viz., about the middle of the day, and at night when about to shut up. At this latter time, also, the plants may be syringed.

If the tank system of heating the stove be adopted, another aid to keeping the atmosphere moist may be adopted, as suggested by Mr. R. Errington, the very able gardener of Sir P. Egerton, Bart., at Oulton *Park. He observes upon* this point, that in applying the tank system to pine growing, it must be remembered that no plan can be regarded as complete which does not provide a perfect command of atmospheric moisture. It must be borne in mind that the moisture arising from a fermenting body is very considerable, and that, at least, an equivalent should be provided. For this purpose it would suffice to have a cemented gutter in the front of the house or pit, on the bottom of which the lower or return pipe should rest. By having a permanent supply of water ready to turn on by a tap at one end, the bottom pipe could be immersed in water at any time in the course of a quarter of an hour. A discharge plug should also be provided at one end, to run off the water into a drain when necessary. The admission of air at front is a consideration; if the point of ingress could be so arranged as to be immediately over the piping, the air would be charged with moisture as it entered, and instead of ascending immediately to the roof, to descend in drip, might be made to pass through the plants. (*Gard. Chron.* 1846, 580.)

Ventilation, and, what is equally necessary, and not identical, free circulation of air, is of great importance for securing the health of pine apples. They should have a little air every day, it being far better to keep them in a temperature sufficiently high to allow of air being given them, than to keep them *shut up in* a damp atmosphere, at a low temperature.

Air will prevent the plants from being drawn up weak, and causes them to have a fine green colour, with thick, firm, robust leaves. (*Mills on Pine Apple*, 31.)

In the winter months, advantage ought to be taken of all bright days, even should the frost be intense in the night, by opening the sashes or ventilators a little; one sash or ventilator in every three should be tilted or let down, at top or back of the house or pit; and as the season advances, a proportionately greater quantity of external air must be admitted. In summer, when the minimum temperature of the external atmosphere is never greater than 52 degs., the sashes of the pits may be left a little raised in the night. This will be found to strengthen the young plants astonishingly; and when the sun is bright, every sash should be elevated six inches, front and back alternately; which will prevent the plants from becoming long and narrow-leaved, and give them a robust and stocky character. (*Glendinning on Pine Apple*, 45.)

Mr. Mills' observations upon this point are excellent, and his directions most practically correct, with the exception of keeping his temperatures rather too high. He says—

There is no doubt but, like the cucumber, pine plants *do best when kept* moist all night by steam or *otherwise, and also* by being dried during the day;

and if that is not possible, it will be well to
the steam or other moisture, and to give a litt
tional heat by the means before stated ; so th
plants cannot be dried in 24 hours, they ma
hours. Plants, swelling their fruit, will requ
air than young plants, as they cannot be dr
weak from want of it. In the morning, air is
ted, when the mercury indicates 75 to 80 d
such quantity as not to reduce the temperatur
that point ; it is injurious to lower the temp
by admitting air, and better to prevent its
giving air early, and allowing it to increase gr
to 90 degs., when more air may be given, but
much as will reduce the temperature below tha
The plants with this heat will have become q
by 10 or 11 o'clock A.M., when they should b
kled with water warmed to 80 degs., so as to
base of their leaves. Mr. Mills then recom
them to be shaded, and the quantity of air red
as to retain in the structure 90 degs. of heat
we cannot agree with this practice of sprinkli
plants in the fore part of the day, after the s
shone on them for some hours, and then to
them. Indeed this appears very much de
from nature's laws, instead of assisting to
them. Circulate or disperse a kindly vapour th
out the interior atmosphere, but do not shade
mit air freely, and shut up in pretty good tim

afternoon, and generally wholly close the lights for a short period, after a good application of water has been given over the plants and whole structure; but then apply air again at sunset, to remain all night, and increase it the following morning previous to the sun shining on the structure. This practice is in no way regulated by what the internal heat may be, though, of course, if the external atmosphere is very low in temperature the admission of air is to be regulated accordingly. In this state they should be allowed to remain till three o'clock P.M., when the shade should be removed, and the air gradually increased, so as to prevent a greater accumulation of sun heat than will keep the mercury indicating 90 degs. At five o'clock P.M., if the plants are quite dry, give them a little sprinkling of water, and take off the air or not, as the temperature may require, thus having them dry, and the reverse, twice in 24 hours. In very hot weather, give the young plants the same treatment as to shade and water, with a little lower temperature in excessive sun heat. (*Mills on Pine Apple*, 56.)

Watering.—During the consideration of the previous practices for keeping the air of the stove moist and ventilated, many suggestions as to watering, necessarily, have been incorporated. The water to be preferred is *that afforded* by rain, or, in its absence, *that from ponds.*

The pine-houses should be provided with the means of obtaining milk-warm water for syringing and watering. This, which is so often neglected, is a capital point in the cultivation of all tropical plants, which are unacquainted with the low temperature of northern countries in any shape, and unprovided with the means of resisting its effects. It is of little use to maintain a steady bottom heat, or a steady air heat, if the warmth of the soil or of the leaves is to be suddenly lowered six or seven degrees by a deluge of cold water. Tender plants do not like cold shower-baths. (*Gard. Chron.* 1843, 837.) To secure this desideratum, an iron tank, with a portion of hot water pipe passing through it, is very convenient and effective.

At Bicton they have many simple contrivances to get a quick supply of this necessary thing. They have, in the first place, draw-cocks to every boiler, and several boilers are furnished with expansion boxes, from which is obtained a supply of hot water in the interior of the structure; in others they have reservoirs; and, again, a hole is drilled in the flow-pipe, and a cock put in in convenient places. When a large supply of hot water is required, by turning cocks they shut off the whole circulation from the pipes to boiler—have nothing but the boiler to heat—and set the cock from the expansion box, which is *placed upon* the summit of the boiler running of hot water, while the cold is still running in at bottom from a cistern placed aloft, with ball-cock. They have also, close at hand, cocks in every structure to supply abundance of cold water; so convenient, in some cases, that both hot and cold may be introduced in the same water-pot, or interior cistern, at one and the same time.

There is not the least danger in watering the plants plentifully all over their leaves in winter, or in any time of the year, provided there be a sufficient heat kept up in the tan bed and in the air of the house. But watering the pine apple plants all over their leaves in winter is not to be adopted as a general rule, but only when it is necessary for cleansing the plants, and when done the heat in the house among the plants must be kept not lower than 70 in the morning, and raised to 85 or 90 degs. in the course of the day. (*M'Phail.*) Indeed so far should the gardener be from withholding water from the pine apple in winter, that it is absolutely very necessary in severe weather, at all times when strong fires are required, to give small quantities of water, once in two or three days, according as the plants may appear dry, in which state they should not be allowed to remain; care being taken not to give a great quantity of water at any one time, particularly in winter. (*Mills on Pine Apple,* 19.)

Indiscriminate watering, or an application of it at similar times and in uniform quantities, would be a most mischievous and ill-judged practice. The application of water should be regulated by many considerations. Prominently among these are the state of the atmosphere and the season of the year; during the summer months, when evaporation and transpiration are at the maximum, a corresponding degree of moisture must, by artificial means, be created to secure a growing atmosphere for the plants. Solar heat and light moisture must be relatively and equally supplied; —the one without its due proportion of the others will soon produce disease, and ultimately death. The pine plant ought never to be soaked with water. It would be an important improvement in watering, if it could be calculated in its administration, to give no more than just enough to moisten the soil in the pot, without any escaping at the bottom. (*Glendinning on Pine Apple*, 34.)

When the fruit is in bloom, do not water over the top; for moisture will be liable to prevent the generative parts of the flowers from performing their necessary functions. When the blossoms are past, and the fruit begins to advance in magnitude, then the plants may be watered all over without danger; with this caution, however, not to do it in the middle of the day. In the spring and autumn seasons, the morning *is the* best time for watering the pine plants; but in *summer* the evening is preferable.

Ripeness.—The first sign of perfection in most sorts is their assuming a golden yellow colour, though some discover different tints peculiar to themselves; but the most certain sign of full growth and ripeness is their fragrance. Let the fruit be gathered before it becomes soft; for if left until then, it would be greatly diminished in its perfume and flavour. Cut the fruit from the plant with four or five inches of the stalk, preserving also its crown of leaves at the top. To have it served up in the highest flavour, it should be cut in a morning, and laid in a cool dry place till wanted; but its juice is always more poignant when eaten the same or the next day; though it may be kept 6 or 8 days if required. It is generally served to table with its crown of leaves on. (*Griffin on Pine Apple,* 73.)

Culture in Pots.—After the preceding directions and observations applicable to both modes of planting, viz., in pots and in the beds of the stove, we will now gather together separately the information applicable to each mode.

Growing and fruiting in pots has been the longest practised, and there is no doubt that fruit in every respect equal to that grown in the beds can be produced in this mode. It is also quite certain that, where bark pits are used as a chief source of heat, pot culture is to be preferred, for it enables the bark to be renewed, stirred and mixed with a facility that cannot be attained when the plants are growing in soil resting upon it. But, on the side of bed culture, it must be admitted that much less care and labour are required for its practice, and that if the hot water system of heating be adopted, the chief difficulty in the way of its adoption is removed. Without a combination of pot culture with that in the bed, it is almost impossible to keep up a regular succession of fruit.

It is but due to Mr. Barnes to state that he inclines to pot culture of the pine apple, observing that, "the advantages derived from the turning out pine plants into prepared beds over those cultivated in pots, have hitherto been but small, under our usual methods of applying bottom heat; indeed I have not ascertained that any one has produced superior fruit, or in quicker succession, from plants turned out of their pots than we have, cultivated entirely in pots. I am an advocate for any improvement, and shall adopt the turning out system so soon as its advantages are brought to bear. Turning out plants into a bed of soil placed on fermenting materials, must for a time confine the bottom heat to that extent that it would cause a large portion of the soil resting on it to become stagnant. Through watering the plants and its confinement the heat is liable to subside suddenly; by applying heat *as we have* recommended in a former section, in the 1st *volume, those* difficulties would be got over. Where it is necessary to keep up a succession of fruit, we would recommend the structure to be in small compartments, in order to have at full command the application, or withholding, any of the requisites from those in various stages of fruit swelling or growth. If fruit can be produced equally good from plants in pots as those turned out, those in pots have the additional advantage, that they may be treated individually with stimulants, or these may be wholly withheld at pleasure, and when the fruit has finished its growth a potted plant with its fruit may be lifted out, and placed in a light airy situation to ripen gradually, which is decidedly a great advantage in producing beauty of colour and superiority of flavour. The rich flavour of a large portion of pines cultivated in this country is entirely sacrificed through close confinement, being ripened too quickly, being allowed to stand too long on the plant previously to cutting, and being kept too long after being cut before being made use of. To obtain a pine apple of first-rate excellence, the application of water should be moderated for a time previously to its finishing swelling, and when its swelling is concluding, water, and moisture of air, should be withheld altogether, and the fruit should have the benefit of a light, airy, dry atmosphere. This cannot be accomplished so well in a structure which has fruit in various stages of growth *upon plants turned out* as it could with plants in pots, for these can be readily lifted out and plac light by themselves, or in another structure fresh plant put into its place. A pine apple never be allowed to remain on the plant aft ripe, as this is very detrimental to its flavou best to cut any variety of pine apple a lit viously to its being ripe, rather than to allow main one day on the plant after being ripe. cut in due season it will improve both in col flavour, which should be taken advantage of keeping it too long before making use of it.

Size of Pots.—For full-sized suckers the po be six inches diameter at the top and six inch for succession plants most gardeners employ pot, 9 inches by 7 inches; and for fruiting, 1 in diameter by 15 inches deep. But only and third sizes named are really desirable. no particular time or season for shifting, pot repotting; we do all these at any season of t whenever we fancy the plants seem to rec Never shift a plant, or repot, but twice at th If it is a strong spring sucker, give it but one from the sucker pot to the fruiting pot.

At Bicton, Mr. Barnes employs, for fruitin pots from 12 to 17 inches in diameter and de usually employs those which are 15 inches d and a like depth; and this size he finds be seasons. For luxuriant plants he employs 17 inch pots.

Previously to commencing potting, the soil and drainage must be properly arranged on the potting bench; the lumps of turfy loam on one side, and that which is a little finer on the other. If the plants are large, the work will be better accomplished by two persons than one. First place two large sherds, side by side, over the bottom hole, then add at least an inch of drainage, and upon this place from two to three inches of the selected pieces of loam, then let the plant down upon this; when the assistant will take both his hands and gently grasp the foliage, (for Mr. Glendinning considers it a bad practice to tie up the plants,) in order that the other may regularly fill up all round the ball with the finer soil, which he will be the better able to do, by using a flat and rather sharp pointed stick: when this is done, gently strike the pot two or three times upon the bench, and this will consolidate the whole properly. (*Glendinning on Pine Apple,* 25)

We find it a very great advantage in pot culture—and of course the same advantage also holds good for the turning-out system—not to make use of any fine soil whatever, or any kind of soil which would be likely to consolidate. With the potting-bench batten, as described in the section "Soil," every sod which *is the least close or* adhesive gets a few sharp raps, and then a quick shake, to rid it partially of the fine particles, making use of the remainder in an open, fibrous, friable condition, with rubbly charcoal applied with it as the operation proceeds. Thus the whole soil is an open porous mass of material, readily admitting a free circulation of air and water. The fine part of the soil, so much sought after formerly by some cultivators, we entirely discard, making use of nothing but open rubble, as above described; indeed it is a mass of healthy open drainage. We should act upon the same principle precisely in preparing for turning-out plants, in a proper structure. As to tieing up the plants, on removal for potting, turning out, or any other purpose, if they are of any size we always tie, and make use also of a stake or two for the purpose of keeping the plants steady, which is regulated according to their size and weight. We find it a considerable advantage, for expedition in their removal, besides its securing them from the danger of being broken, which it would be an impossibility to prevent to some extent with such large-sized, weighty, crisp-foliaged plants as we cultivate, and which crack and break with almost the least touch; besides the great advantage the tieing system has for removal through door-places at the potting-bench, and the replacing them again, over the loose system, is very considerable, and pretty generally *acted upon* by cultivators.

Instead of using, as in former days, a sharp-pointed stick, in order to thrust down, and regularly to fill up with the finer soil, we make use of a blunt square piece of wood, at least, for potting pines, two inches square; the soil, instead of being rammed down, as formerly recommended, and in too many cases practised, we quietly push down. Thus a porous kindly mass is secured, and fully maintained.

Mr. Mills and all good pine growers, agree as to the importance of good drainage to the pine apple. Use, he says, a good quantity of drainage. Broken garden pots are good for this purpose, a few large pieces at the bottom, and the upper ones very small; and oyster-shells or charcoal would be equally good. Be the material what it may, an effectual drainage must be secured, on which is placed about one inch of the rough compost; and the bottom of the ball of earth, containing the roots of the plant, is placed thereon. If from one inch to one and a half inch of fresh soil is given at top, bottom, and sides, it will be a good remove or shift. In March, the plants, if well grown, will require to be looked to and shifted; again about the middle or latter end of May; and again in August usually for the last time; but every thing will depend on the time the fruit is required. A plant will seldom show fruit until it has filled its pot with roots; therefore, if large plants are not re*quired to show fruit,* they must be kept growing by giving them fresh food and larger pots, with plenty of air. The largest pots Mr. Mills uses are those of eight to the cast; next size is 12, and the smallest 16 to the cast. (*Mills on Pine Apple*, 29.)

Mr. Glendinning agrees with us in thinking that the time when the pine plant requires a larger pot must always be determined by the progress the roots have made: let this on every occasion be the criterion, and on no account shift a plant into a larger pot, merely because it may be a general shifting, unless the roots have made sufficient progress to justify the act. Although we shift usually only twice, yet we agree in thinking it impossible to state how often the plants ought to be repotted, under all circumstances, or finally determine the capacity of the pot in which the plants will mature their fruit. They must be shifted as often as they require it; which operation should be resolved by the progress the roots make from time to time, until they attain a size to justify their removal to the fruiting-house: when there, should they continue growing, they must still have larger pots, until they show indications of fruiting, and even then, if the roots have extended through and completely enveloped the ball, a larger pot must be substituted. (*Glendinning on Pine Apple*, 23.)

Arrangement of Plants.—The same good practical authority gives the following directions on this point. The seasons of completely renovating the bark bed are March and October. At each of the periods the plants are to be entirely removed from the pit; at one end a trench opened three or four feet wide, and the tan removed to the other. The new bark is to be placed about a foot deep over the bottom of each trench, and particularly against the sides of the pit, as the new will ferment stronger, and the centre of the bed is sure to be hot enough; besides it will decay much faster around the edges of the bed than in the middle. A corresponding quantity of the old decayed bark must be removed as you proceed to make room for the new. Select the largest for the back row, and so also for each consecutive row. The largest for each row again ought to be placed in the centre. This arrangement, on the whole, will give the plants a better appearance than if promiscuously plunged, and will also afford more room to the plants individually, more particularly if placed in the quincuncial manner. The pots ought not to be inserted more than half-way into the tan, until the heat, which in a few days will become too powerful, has subsided. Daily examine the temperature of the bark bed; for the least oversight at this critical juncture will entail positive ruin to the fruiting plants; especially as, should the roots now get scorched, the chance is, that every plant in the pit will be prematurely forced into fruit, in a weakly, exhausted condition, from the unnatural loss of those *abundant strong roots* which they are now supposed to have acquired. The manner adopted by practical men to ascertain the heat of the tan bed, and which will be found sufficiently accurate, is to insert a few sharp-pointed sticks in front and back of the bed, and a very little acquaintance with these will constitute them an unerring index. Should the temperature of the bed be ascertained with an instrument, 90 degs. will be a good medium heat; but it ought never to exceed 100 degs. When the fermentation becomes too powerful, water should be poured around the outside of the pots, and all over the bed, which will immediately subdue the extreme excitement; but should extraordinary fermentation require a repetition of watering, so as to endanger drenching the bed, the tan ought to be partially removed from the sides of the pots, and again replaced when the heat declines. (*Glendinning on Pine Apple*, 30.)

We entirely and unreservedly condemn the system of applying bottom heat by tan or other fermenting materials, or upon any other system, so as to endanger its becoming dangerously hot, and requiring so much watchfulness and daily examination; as plunging the pots not at all, or only half way, to be removed when danger occurs, or pouring water about; all of which act as injurious checks to thrifty, healthy plants, besides the danger of being too late in the *precautionary* applications. Surely the time has arrived for men to have their mind's eye open to secure a more simple, uniform, genial bottom heat, applicable at all times and seasons just to the required extent, without all the above former-days' complicated methods of watchfulness. Surely in these times no cultivator needs advice or caution regarding the application of bottom heat, for no well-instructed gardener of our days would now think of preparing a dangerous, expensive, laborious bottom heat, and then practise a remedy also equally dangerous, to avoid its evil consequences! These are not times, we should hope, that such things are to be found in practice, but are only matters of record.

Disrooting.—The old system of pine culture used to adopt as a principle that which is now justly condemned as the worst of all practice—the frequent disturbance and even destruction of the roots. So far from this being desirable, let the gardener ever keep in mind, both for this and all other crops, that the less the root is disturbed the finer will be the produce. Upon this point of pine-culture we will quote Mr. Hamilton's very judicious remarks. He says, neither shaking out, nor transplanting healthy plants into larger pots after the fruit is cut, can be adopted as a general rule, without deteriorating the quality of the succeeding fruit. Therefore merely dress off the bottom leaves, *as high as* where the roots appear; *which is generally two or* three inches above the level

plant, and allowing it to slope down to the
the pot. The plants, after earthing up, w
mence growing immediately, and new roots
thrown out from the bared trunk into the fr
If water has been withheld for a time, on ac
improving the flavour of the fruit, they ought
a good watering at their roots; but if in the w
must be applied more sparingly; and a grow
tom heat of about 80 degs. be kept at tl
This watering do not repeat until the next fru
but endeavour to keep the soil continually m
wet,) by frequently syringing over the leav
lukewarm water. By attention to waterin
atmosphere, &c. the suckers will grow rapidly,
fect their second fruit, generally speaking,
eight to twelve months from the time the f
cut. If the plants have met with no accident

plant, to the bottom of the large pot, first placing three or four broken pieces of pots at the bottom, to prevent the communication of heat between their bottoms. A cavity is thus formed all round, between the two pots, which will prevent the roots from being scalded. Although buried deep in the tan, the outer pot ought to be several inches deeper than the inner one, and in earthing up, observe to put nothing but broken bricks above the cavity, so that the heat may freely escape to the surface, without injuring the bottom roots; and at every process of earthing up, nothing but the sods, or the lumpy part of the compost, ought to be used; and fresher the better, provided the vegetable fibre is dead. All the varieties of the pine, except the White Providence, have one sucker or more in progression, whilst the plant is swelling its fruit: in such cases one only ought to remain, the others should be destroyed as they appear, except the cultivator prefers quantity to quality. At every process of earthing up, none of the leaves must be shortened nor taken off, except a few at the bottom, to allow the emission of new roots into the fresh compost; and whenever water is used, either to the roots, or by sprinkling the foliage, it ought to be several degrees warmer than the atmosphere in the house. After the fourth fruit has been perfected, cut off the sucker which *produced* the last fruit, with from six to *eight inches of the old* trunk attached to its bottom.

The leaves are all dressed off that portion of t tached trunk, and from the bottom of the which will have made a quantity of roots in t of the leaf of the detached trunk, and is then into a pot, nine or ten inches diameter at the to ing the detached trunk at the bottom of the pot, the drainage is put in, in order that the suck be sufficiently deep to be covered with the soil. plants are cut down in the winter, they ought planted in very small pots, or they may be pla fresh tan, and taken up, and potted in the spri a pot ten inches diameter at the top; and th intended to perpetuate a successive progeny of and fruit. (*Hamilton on Pine Apple,* 70.)

Root Scorching.—To avoid this, the best to sink a pot into the tan large enough to that in which the pine apple is growing, and le vacant space, half an inch wide, all round. gardeners merely lift the pot out from the ba obtain a similar vacancy by placing a brick or the bottom of the hole, and then returning t Other gardeners use inverted pots in the st bricks.

The gardener at Mowley Hall Gardens mends—Instead of inverted pots, or two bricks *sideways,* use two iron rods 1½ inch wide, an *an inch thick*; these rods are exactly the

the pit, and the flat sides are rivetted in three places, at equal distances, and six inches apart, for the pots to stand on. An iron bar extends the whole length of the pit, with hooks fastened to it at the distance the rows of plants are to be apart; and this is made fast to the back wall of the pit with flat-headed iron pins, which go through the wall and the bar, and are screwed tight in the inside of the pit with burrs; on the front wall of the pit double brackets are suspended at the proper distances, and fastened inside of the pit with nails made on purpose, so that they cannot move either one way or the other. These and the iron bars are fixtures, but the rails are made to take out and in, so as to be out of the way in emptying and filling the pit. In plunging, the leaves are taken out at one end of the pit, as deep as the bottom of the brackets, and carried to the other to fill up with; the rails are then dropped into their places, and the pots placed upon them, the shortest plants in front and the tallest at back; the leaves are then filled in even with the top of the pots; another row is then placed the same as the first, and so on till the whole is finished. As the leaves sink down more are added, so as to keep them up to the top of the pot. The advantages of this plan are these:—The plants are always at the same distance from the glass; there is little trouble in *plunging* them, it being only necessary *to place them upon the* rails, and push them along to their proper places; there is no danger of burning their roots, from the facility with which the fermenting material can be stirred and changed, the top of the pots being always a little higher than the pit; and, finally, one plant can be substituted for another as soon as it has ripened its fruit. Pines never grow or swell their fruit well without there is a genial moisture in the pit. If the leaves become dry, have them pulled into the walk with a hoe, where one man turns them over, while another sprinkles them with water, warmed to a temperature of 90 or 100 degrees, the heat of the leaves ranging from 85 to 95 degrees; they are then returned among the pots, and the house is kept close for a day or two to encourage fermentation. (*Gard. Journ.* 1847, 194.)

Planting in Bed.—This is by no means a novel suggestion, nor practised for the first time in the present century; but Mr. Hamilton, the very excellent gardener at Thornfield, has the merit of enforcing its practice more extensively than had ever been previously done. This he has done not only by example, and growing very superior pines by this mode, but also by publishing an able little volume upon the subject, and from which, in several instances, this volume will be found enriched.

The earliest adopter of this system, we think, was *Mr. Justice,* who, writing in 1754, says, he (Mr.

Justice) tried some plants turned out of their pots with their balls, and planted in the bark for the last nine months before the fruit ripened, and found the fruit larger and earlier, but not better flavoured, than that of the plants in the pots.

The later and better experience of Mr. Mills sustains the same opinion; for he observes, that plants, when growing without pots, acquire naturally a dwarf growth, more particularly when not crowded. It is quite remarkable to see the different habit the plants assume when planted in the open soil; and, should they have been growing in pots for some time previously, the alteration will be the more perceptible, as they seem to change their habits all at once, by expanding their foliage, and also by a rapid swelling of their bases or stems, caused, no doubt, by the increase of food to their roots, combined with regularity of heat and moisture. (*Mills on Pine Apple*, 62.)

Next to Mr. Justice in pursuing this plan was Mr. Giles, who, writing in 1767, says more explicitly, when the bed is a little settled, lay on a border of the same kind of earth as before mentioned, at about one foot six inches wide on the surface of the tan, entirely round the bark bed, which may be kept up within side by planks, &c. The intention of this border is, to turn part of the succession plants out of their pots into *it, which, when* they are brought into the stove *are then called fruiting* plants. This border sho be just so thick with earth as to contain completely the balls of the plants after they are turned out, allowing a reasonable distance, which in a pit that is capable of receiving a hundred plants, the border round will contain 46 of them. One end of the border should be left unplanted till last, for the conveniency of filling the middle of the bed. When the border is done, bring in so much tan as will fill up the middle part of the pit; then the remaining plants should be shifted into pots a size larger, as may be necessary, and plunged in the tan at a reasonable distance. (*Giles on Ananas.*)

The system does not appear to have been even partially adopted, until attention was again roused to it by the late President of the Horticultural Society. Upon this, Mr. Loudon observes—

The present practice is exactly the same that Mr. Knight commenced with, and it has years ago been recorded in the Transactions of the Horticultural Society. As soon as the plants shew fruit, the strongest sucker is preserved; all the others being taken off as they appear. When the fruit is cut, the plant is taken out of the pot with as many roots as can be removed with it; all the leaves, except four or five on the top of the stool, are scaled off; the leaves are also scaled off the base of the sucker in the usual *manner.* The sucker, however, remains growing on *the stool* until, in its turn, it becomes the parent plant, producing fruit and suckers, and undergoing the same operation as its progenitor, whose place it is to occupy. The few leaves left on the top of the stool are, as they become matured in the course of the season, plucked off; so that the whole stool, being entirely covered with earth, produces abundance of young roots, which continue to supply the rising plant with additional nourishment, independently of that obtained by its own immediate roots, until it has performed its office. The pines were never moved out of the pots in which they were first planted; and at all seasons, excepting in the depth of winter, the house was kept in a state of humidity. (*Gard. Mag.* ii. 368.)

Upon the details of Mr. Hamilton's practice, we shall only further add some remarks made by himself and by Dr. Lindley, adding the modes adopted by Mr. Gray and Mr. Dale for carrying out the same system. Dr. Lindley observes that—

Mr. Hamilton has but two moderate-sized houses for the whole of his processes, as far as pine-growing is concerned: in one of these, the principal fruiting-house, he grows winter and spring cucumbers; the only crop which can (according to Mr. H.) be grown with propriety in a house, the primary object of which is to produce abundance of first-rate pine apples. Mr. H. entirely repudiates the idea of growing grapes *or pines, more especially* late grapes; as, if such be the case, it must be done at considerable sacrifice. The amount of atmospheric humidity necessary to carry out the Hamiltonian system would be extremely prejudicial, if not ruinous, to both the general health as well as the productions of the vine. The first and most peculiar feature in Mr. H.'s system, is fruiting the sucker on the old stool, which is nature's own way of doing the business. The second feature is the preservation of the old roots for a much longer period than is commonly practised—say for nearly seven years. The third, although much at variance with preconceived opinions, appears to answer, and is the maintenance of a high and moist atmosphere all the winter. The fourth consists in a much more moderate use of bottom heat than is customary. Mr. H. considers about 82 degs. to be the most wholesome maximum. Now, alluding to the preservation of the old stool, it seems strange that, seeing this was so long since recommmended by the late Mr. Knight, it has not crept more fully into practice. If it can be proved that the old stump is a storehouse, or ready provided fund of organizable matter, which it has taken some expense of both time and material, as well as vital energy in the system of the plant, to provide, why not retain it? Who would think of cutting away all the green pseudo-bulbs of a new and choice orchid? The second feature, viz., the preser*vation of all* the old roots for an almost indefinite pe riod stands boldly opposed at once to all disrooting systems. According to Mr. H., two serious evils are involved in the attempt to get abundance of new white fibres up the stems, viz., the necessity of stripping a considerable amount of valuable foliage; and, secondly, that these white surface roots, if procured, will in all probability produce premature constriction, if not decay, in the original roots, thereby losing the valuable assistance of thousands of mouths, adhering fast to various media, capable of supplying all the wants of the plant. The third feature, viz., a high and moist atmosphere through the depth of winter, appears to be the most disputable ground in the whole. Fourthly, in regard to bottom heat, although Mr. H. may be very right in so moderate a use of bottom heat (when coupled with the rest of his system), yet, such a moderate degree, if the best for plants thus circumstanced, is by no means binding on those who cultivate them by the old or any other system. Mr. Hamilton has a heated chamber under his fruiting bed, and this circumstance enables him to preserve his roots undisturbed as long as he pleases. Mr. H.'s pines are rooted over the top and through the bottoms of the pots, drawing quite as much nourishment, in all probability, as though they were planted out in the bed. (*Gard. Chron.* 1845, 595.)

Mr. Hamilton is now endeavouring to increase still further the amount of fruit from a given number of stools, by ripening more than one upon each. To use his own words—

His attention has been directed to the producing two fruit on one plant at the same time, and he is getting entirely into this practice as fast as he can. Hitherto he has experienced little difference in size between each of the two fruit so produced and the single ones. Moreover, those plants that produced a brace last year, have produced a brace this year also. With regard to the size of the fruit produced by the old stools, in most instances they have surpassed those from the maiden plants. Mr. Jennings, of Worsley, has cut a brace from the Montserrat (Black Jamaica of some,) which weighed 10lbs.; other varieties have been produced, of equal weight, by other persons. (*Gard. Journ.* 1845, 716.)

Mr. Hamilton also gives the following directions. After all the plants are taken out of the bed, let the old tan be levelled, well trodden down, and smoothed with the rake; the whole bed then covered with fresh tan to the depth of ten inches; the plants immediately taken out of their pots, with their balls as entire as possible, and plunged into the bed, beaten tightly about the ball, and covered to the depth of one inch only. If the ball, with the roots, be covered too deeply, they will be in danger of being burned. The tan used for this mode of culture must be made from British bark, as it undergoes a slower putrid fermentation than foreign tan; and is rendered less fit for supplying the plants with food. In old, decayed tan, the plants make very little progress; the fruit also is of inferior size. Foreign tan is objectionable, as it soon decays. When pine plants are turned out into the tan in the winter season, their growth is so rapid, that, except they have plenty of air and light, the young leaves are apt to blanch. For several weeks after planting, the surface of the tan ought to be frequently stirred with a rake or long stick, to prevent any fungous breeding, to effect the escape of the superabundant bottom heat, to allow the atmosphere to have free access to the roots, and to keep the tan in a clean, pure state. (*Hamilton on Pine Apple*, 62.)

Mr. J. Gray, of Esher, for fruiting the same plant for several successive years, instead of raising a fresh stock annually, says, the pit in which they are grown should not be less than 10 feet wide, and should be built in divisions of five lights each; the frame-work being also so constructed that the part belonging to each division could be raised separately when required. The thickness of the wall at back and front should be 4 inches, with only a pigeon-hole occasionally along the bottom, to allow the water to drain from the interior of the pit. Within the outer wall, and at about 4 inches from it, another wall, a foot less in height, *should be raised; the* cavity between being intended for the reception of a hot water pipe, which must be fixed before the inner wall is completed, and should be about 2 feet above the level of the floor of the pit. The depth of the pit should be about 6 feet; the front being a little higher than the ground level, and the angle of the roof left to the builder's taste. He also recommends a cavity, 2 feet wide at the bottom, and 6 inches wide at top, to be formed round the pit, about six inches deeper than the level of the interior, to hold a lining, so that the hot water apparatus might only be called into use during severe weather. The bottom of the pit should be covered several inches deep with rough stones, over which any common slabs, or, in their absence, pieces of turf, may be spread. This will prevent the tan, which is next to be brought in to the depth of 18 inches, from falling down amongst the stones. The compost in which the plants are to be plunged should be about one foot deep. The latter, when planted, should be just upon the point of throwing up their fruit. The pit will be sufficiently capacious to admit of four rows being planted out in angles two feet apart. After the first fruit has been cut, one or two of the best suckers should be left, as low down as possible, on each stool; the old leaves should be trimmed off, and a few inches of fresh compost should be added, so as to raise the mould up to the base of the suckers. This treatment might be continued annually; and as soon as the plants reached the glass, pieces of wood about four inches thick and a foot in height, made secure at the corners by means of small bolts, might be raised upon the wall beneath the frame-work. Upon the top of each piece of wood there should be a groove, in which the bottom of each succeeding tier would fit. Each division of the pit being separate, the frame-work might be taken off whenever it was necessary to add another tier; and the top of the pit being built but little above the level of the ground, these tiers of wood might be continued to the height of two or three feet. It would not be necessary to raise the lining higher that the top of the brick wall, as there would no doubt be sufficient heat in the bed from the lining and the hot water; which latter, being in the cavity, would warm the soil sufficiently. Boards made to fit above this cavity would be beneficial in keeping the dirt from falling down between the pipe and the walls when mould was required in the pit. The boiler and fire-place might be situated at one end of the pit. (*Gard. Chron.* 1843, 100.)

Mr. Dale, gardener at Brancepeth Hall, near Durham, gives some further directions for this mode of culture. He says that the treatment, supposing the first fruit to be cut, and the suckers and old plant growing away in a vigorous state, should be as follows:—The suckers to be reduced to one or two, according to the *health of the plant,* and when the roots become much matted, a few of the bottom leaves pulled off to allow the plant to make fresh roots in a top-dressing of rich compost; the plant to have a moderately moist heat in the bed, and a moist atmosphere kept up, and the plants situated as near the glass as possible. In pursuing this mode of culture, give the plants, if free rooters, a fair portion of water, and if the soil should become much exhausted, give liquid manure occasionally, allowing the plant and sucker or suckers to grow on until they are strong enough to produce a good fruit; then the plant being tied up, turn it carefully out of the pot, and with sharp-ended prong reduce the ball as much as possible, without injuring the fresh roots; then place the plant having part of the ball attached as low in the pot as you can, placing a small portion of compost in the bottom of the pot, and leaving a little room at top for top-dressing afterwards; by this means the plant will receive a partial check, and in making fresh growth will generally show fruit. The success during the following years will depend upon the health and treatment of the mother-plant. If the suckers break off from the plant near the pot, endeavour to give strength by putting a circular case round the rim of the pot, and by this means you can add compost to the roots of the suckers, previously pulling off a few of the bottom leaves. (*Ibid.* 1845, 70.)

Mr. Errington, gardener at Oulton Park, whose able remarks have been already quoted, adds these warnings upon this mode of pine culture :—

The young suckers on the old stool ought to be always growing, but in very dark weather 65 degs. during the day will suffice, and answer a better purpose than a higher atmosphere, supported by enormous fires. With a humid atmosphere, they will make much progress even during the winter; at least his plants do. Dormancy and dry air are both positively injurious, particularly a dry air; the leaves will become debilitated, and their energies so impaired that they will be very unfit to meet the exigencies of the plant when the growing season arrives. The pine-leaf should be so brittle that it can scarcely be touched without breaking; and when such leaves are cut with the knife the sap will directly ooze out from the inner tissue of the leaf. In this state they are prepared to meet a July sun. (*Ibid.* 1846, 252.)

The following observations by Mr. Errington apply to all modes of culture :—

When you cut your fruit avoid as much as possible any damage to the leaves. Preserve by all possible means your old roots. Young or stem roots are all very good adjuncts, if honestly obtained; let them not, however, be petted at the expense of the original roots. If two suckers are left equally in a perpendicular position, and the agencies pointed out by the *Hamiltonian method* applied to promote rapid growth, they may each be expected to produce a fruit as large as the one preceding. Neither can they fail to do so in a very few months, if the proper means be properly applied. (*Gard. Chron.* 1846, 252.)

Number a Bed will contain.—If a pine pit is constructed 8 feet wide in the clear, and in compartments of 32 feet in length, each compartment will hold 38 or 40 strong fruiting plants, either in pots or turned out. Eight feet is a very convenient width for getting at the whole of the plants to water, and to attend to their general wants. The pit may easily be constructed in shorter compartments, and it is certain that pines cultivated in any stage of their growth in small compartments may be most readily supplied appropriately with heat, air, and water.

CALENDAR OF PINE CULTURE.

This department of our subject is beset with difficulties, for even some of the most successful cultivators of the pine apple vary when they assign the temperatures, degrees of moisture, &c., appropriate to particular periods of its growth. Moreover there is no doubt that those circumstances should be varied according to the brightness or cloudiness of the season, and according, also, to the vigour of the plants.

Mr. Barnes, therefore, is quite right in observing that success in pine culture does not depend upon the expense bestowed in erecting the pit, nor in applying to it a heating apparatus of great efficiency; neither is it secured by obtaining vigorous plants of the best varieties; nor by procuring the soil, without regard to expence, from the locality from whence it is well known some celebrated cultivator procured his soil. Neither is success dependent upon a precise quantity of any kind of manure, either in a solid or liquid state; nor upon drainage, nor upon repotting, nor on the size of the pot, nor on a certain season of shifting. So neither is it obtained by the application of just one certified degree of heat, either at bottom or top; nor one stated method of applying air and humidity. None of these circumstances alone, nor even a major part of them, will secure excellence in the growth of this fruit; all are requisite, but, above all, foresight and attention; applying the whole of the requisites in combination and uniformity with each other.

Coinciding fully with this opinion, we rejoice in being able to place before our readers the results of the experience of two such men as Mr. Barnes and Mr. Errington. The latter has obliged us with the following Calendar of operations, and we have placed within brackets the directions furnished to us by Mr. Barnes upon the same periods of the pine apple's *growth.*

The monthly division of business which h rally been adopted by those who have attem lay down rules for the inexperienced—for whc we intend these remarks—appearing to us t efficient to the end in view, we have deemed dient to take a somewhat wider footing, and t vour so to group the main features of the sul that a mere tyro, although confined as to pri may be totally unfettered by mere rules; a consequently, as a matter of convenience, gre dify his mode of culture, so as readily to n contingency. We may also here state, that thought it necessary to confine ourselves to culture of pines, on the old bark bed syst those who can cultivate pines well by that m safely be entrusted with the tank. We have possession for either the Meudon or Ham system; but believe that they are both good way. We have, therefore, occasionally adv them when considered necessary.

Before proceeding further, we would offe remarks on the following important processes nected with pine culture in all its stages, wh be useful preliminaries, as tending to preven tion in what follows :—

1. General principles of potting.
2. General principles of watering.

3. General principles of syringing.
4. General principles of ventilation.

1.—GENERAL PRINCIPLES OF POTTING.

The question of soils having been discussed at p. 65 of Vol. I., we need say little here on that head, but merely observe that they must by all means be in a mellow state. Quite agreeing with Mr. Barnes in repudiating the use of wet turf or other composts, we will append a few remarks at the conclusion as to good modes of harvesting soils.

A continual succession of fruit being the aim with which we must set out, it follows, as a matter of course, that any general shifting, in the old acceptation of that term, must have a tendency to defeat the end in view. We, therefore, say, that the more progressive the shiftings are the better. As a general rule, however, we would say shifting might be entirely dispensed with from the end of October until Christmas. We consider that the root during this period should be allowed a comparative quiet, for an over active root would but weaken the general fabric of the plant, which it is the business of the clever cultivator to solidify by the last remains of autumn sunlight.

With regard to shifting, we would in the first place *protest against shifting* without a sufficient reason,—

that is to say, a pot full or nearly full of healthy roots. Another point we would urge, is to give liberal shifts. We would in nearly all cases, excepting in mere sucker treatment, have the fresh pot nearly four inches in diameter more than the pot whence the plant is removed. One favourite plan of ours is to continue pressing in gently lumps of porous turf round the sides of the pot during the process, merely casing with a general mixture at the close of the operation.

In the present state of pine culture we would advise that porous turfy loam, of a somewhat adhesive character, should constitute by far the largest half of the mixture. Indeed, if from rich lowlands, which have been employed for a score of years, we have no doubt that, coupled with a proper system of liquid manure, it would be found complete in itself without any admixture. For general purposes, however, we would say, mix some stimulating manures and a little half-decayed leaf-soil or peat with the mass, adding plenty of coarse charcoal poundings, with some coarse sand.

Pots with concave bottoms are the first essential, with a very large hole or holes for drainage. If such are not large enough, or the bottom looks suspicious, knock a hole larger with a hammer. The crocking is another and most important matter, for if the *drainage* hole becomes choked, it matters little how much pounded material is placed over it—all becomes nullified. Therefore, so to arrange the first crocks over the hole in the pot as to preclude the possibility of its choking up, and to guard these again by another course and order of drainage, constitutes the chief part of the philosophy of potting. We generally place one huge hollow crock half overlapping the hole, a second half overlapping that, and a third overlapping both; by which means we have at least three main outlets for water; and it is very improbable that all should be choked at once. This accomplished, we cover to the depth of one-fifth of the pot, be its size what it may, with a mixture of pounded crocks, charcoal, and bone, in about equal quantities. A little turfy matter, with nearly all the soil battered out, is then thrown over the crocks, and on this the ball is placed, taking care so to calculate as to the depth of the pot that the surface of the ball will bear a coating of an inch or two of the prepared mixture, which, as we before observed, we consider necessary as a sort of regulator of moisture; for, without this the moisture of the soil or turf would be liable in extreme dryness of the atmosphere to evaporate too speedily. The ball being placed in the above preparations, lumpy mellow turf, shook in a coarse riddle in a dry state, to dispossess it of much of the mere earthy particles, is crammed in around the ball to *wedge it in its position*. Over this, a layer of the prepared mixture is strewed, then another lot of turfy matter, and so on alternately, taking care to finish with an inch or two of the compost.

One remark, generally applicable, should here be made, viz., that in all cases of shifting with sound balls and healthy roots, that such balls should, if dry, have a liberal watering a couple of days previously to the shifting: this supersedes the necessity of watering close on the heels of potting, which is a practice to be avoided.

2.—GENERAL PRINCIPLES OF WATERING.

This is a difficult part of the subject to deal with, and the remarks we may make will be given, and we hope received, with much caution. No plant enjoys water more than the pine judiciously applied, whilst it is equally certain that no plant sooner suffers from an injudicious application of this needful liquid. Varieties also differ in the quantity they require; for, whilst the Black Jamaica (Montserrat of some,) would do with a watering once in a fortnight or once even in a month in the height of summer, the Queen, under a similarly very high temperature, and in full vigour, would grow, in what might be termed, by way of illustration, a hot ditch. Plants of robust habit and under high temperatures will of course require much more water than those not so strong; but if any doubt arise in the minds of the inexperienced, we would say withhold water, and endeavour to compensate for its absence by an increased amount of atmospheric moisture.

With regard to suckers rooting, and young stocks recently potted, especially in the winter or spring seasons, we say give no water if possible until the pot is half filled with roots. Indeed, as before observed, some time should elapse in all cases of recently shifted plants before water is applied: we would rather depend on an increased amount of atmospheric moisture.

3.—GENERAL PRINCIPLES OF SYRINGING.

As sufficient humidity of atmosphere cannot, in the present state of gardening affairs, be supplied in the form of steam, or rather of vapour, syringing is had recourse to, and a very useful adjunct it is in pine cultivation. One of the first maxims with our best pine cultivators as to the regulation of this power, is to take care at all times that the lodgment of water in the axils of the leaves (consequent on the previous syringing,) has evaporated before more is supplied: at least, this is a very safe maxim with beginners. When much syringing is indulged in, a very great amount of heat must also be allowed, especially solar heat. We *are of opinion that* syringings could scarcely be too frequent in the hot season, providing the above rule were observed, viz., to first suffer the water in the axils to evaporate. However, as the accumulation of solar heat must be limited, and at least bear a proper ratio to the intensity of light, moderation must be observed in this as in other matters.

4.—GENERAL PRINCIPLES OF VENTILATION.

We here find ourselves on somewhat disputable ground, for practical men differ, perhaps, more on this particular than any other. Some are for having their houses, as it were, hermetically sealed; others talk about the wind blowing through them.

The horticultural public, we are glad to see, are at last becoming alive to the importance of settling this branch of cultivation on a more permanent basis than the mere opinion of any particular individual. For ourselves, we are great advocates for a motion or circulation in the atmosphere; and we are happy to say that we find Mr. Barnes, as well as several more first-rate and truly practical gardeners, agreeing with us on this point.

To lay down anything like general rules is very difficult, especially in the present position of such matters. We would merely observe that we ourselves give air night and day at all times, were it in ever so *trifling* a quantity, providing, we feel certain of securing the requisite amount of heat, and, what is more, of atmospheric moisture. This last, in the majority of hothouses, is the great difficulty; and how to get a fresh circulating air, without loss of atmospheric moisture, is indeed the great gardening problem that awaits solution.

Air with motion (yet without what is termed draught) is truly beneficial to most plants; and, as a concluding piece of advice, we would say, endeavour as much as possible to make front air suffice; there is more change of atmosphere when the front sashes alone are raised than people commonly imagine.

We now proceed to say a few words on the subject of general cultivation, and we think we cannot do better than commence with the

GENERAL ARRANGEMENT OF STOCK IN THE WINTER AND SPRING.

[JANUARY.—*Fruiting Plants and Fruit Swelling.*—Night temperature not to exceed 60 degrees, and have no objection of a cold or dark, foggy morning at day break, to observe the temperature down to 55 or a degree or two less. Humidity in very dark, foggy, rainy, snowy, or severe blowing weather, is to be applied with some caution and moderately; but always damp the paths well, morning and evening, *with tepid water*—*never* employ cold water. Take advantage of light mornings, and then apply light syringings of tepid water about the axils of the leaves, and over the whole of the surface of the plunging materials with generally a quart or two of clear soot water or liquid manure, applied to a 4-gallon water-pot of clear soft water. Never allow the plunging materials to become dry and parched, and never think of putting it out from amongst the pots into the walks to moisten it, as frequent sprinklings will continue about it a kindly moisture. The bottom heat, of course, at this season should not be excitable but genial and moderate, from 72 to 80 degrees or thereabouts. It will a little fluctuate by the influence of changeable weather. If a little additional heat at this season is required, as it probably will, if no additional fermenting material has been applied since autumn, apply it now on the surface with a fork and rake. The outside of the plunging bed is to be pushed and circulated about, and amongst the pots all over the surface as lightly as possible, and then the fresh material is to be applied to fill up the vacuum thus made.

This is very quickly and conveniently performed; but on no account remove the fruiting plants, to renew the bottom heat with fresh fermenting material, which would not only be likely to check them at this season, besides the extra attention required in watchfulness of the renovations, in order to be safe from over-heating, which would probably occur; and a very little excess would do the roots an irreparable mischief. As to setting the plants on the surface of the bed for a time, as is recommended by some gardeners, the question is, whether such a remedy would not be almost as bad as the expected evil sought thus to be avoided.

Succession Plants in structures heated by dung, or other fermenting materials, will do very well and grow quite fast enough if the interior atmosphere is maintained from 50 to 60 degs. with air admitted, provided the heat is applied upon a good principle from the top of the outsides of the structure, to allow of air to be given to pass off any superfluity of vapour, the escape of which is most essential at this season. Plants grown in a strong humidity at this period of the year would be likely to suffer from debility, instead of acquiring a healthy sturdiness and a moderate progressive growth, and dark green colour, which will always be maintained with a moderate heat properly applied, with sufficient air, to preserve the foliage of the plants from a wet or damp appearance, which at this season is dangerous to their well-doing. To prevent excessive dampness the bottom materials should be in the most genial condition, and the linings be applied at top of the sides of the structure instead of at the bottom. This heating *from above,* to a considerable extent, *would act similarly to* the sun shining in drying and modifying a humid atmosphere. Water at no time should be withheld if at all needful. Apply it little and often at this season rather than by large portions, and only occasionally.

February.—In this month, says Mr. Barnes, we advance the temperature a few degrees, as the month progresses and the light increases. Also we apply a more liberal humidity amongst the fruiting plants and fruit swellers, syringing a little more about their foliage, and giving them an occasional liberal syringing of good manure water about and amongst the lumps of charcoal, which lie on the surface of the plunging material; damping the paths, walks, and the whole of the interior of the structure pretty often on bright days, and occasionally turning on moderately, for a short time, the perforated water pipe; all of which combine to afford a general humidity to the interior atmosphere, which the pine plant in every stage of growth truly delights in. By the end of the month our night atmosphere is increased to about 60 or 65 degs., but rarely the latter, and not without we have had bright light days, for a strong fire heat, we are perfectly satisfied, retards the fruit from swelling kindly, and weakens their first showing fruit. We entirely regulate the interior night heat by the daily light we receive, and very seldom do we advance beyond 63 degs. in the month of February: from 60 to 63 degs. is our general maximum.

The Succession House, too, we advance a few degrees, and like to see it opened of a morning in light weather with a temperature from 57 to 60 degs. with covering, but lightly, with air, and a genial humidity, but not steam, so that a leaf looks wet.]

TOWARDS THE END OF FEBRUARY, says Mr. Errington, with regard to fruiters, if a proper structure exists, these will all have been fixed in the autumn to remain without disturbance, and little will require to be done except stripping away any decayed leaves and adding some top dressing of porous turf. After this is done the tan bed should be well stirred up in the way Mr. Barnes recommends, and a little new well-wrought tan added; slightly to increase the warmth, which for the fruiters at this period may be permitted to rise to 80 degs. A greater heat may be indulged in, but this we consider a safe proceeding.

For successions, from the sucker or crown upwards, a scheme of summer cultivation must at once be decided on, and the plants classified accordingly. If any are to be continued in pits or houses, in which the tan pit was made anew in the autumn, little disturbance will be necessary. If, however, new beds have to be prepared, some little extra labour will be required. Tree leaves, especially of the oak, are by far the best, and these should be fermented with a trifling mixture *of dung before using.* In taking out the decaying matter from the pit, a considerable portion may in general be reserved to mix with the new materials. About four feet in depth must be provided, if leaves are to be had, beneath the plunging medium: if, however, the structures are mere frames, they must be kept somewhat higher in order to carry sufficient linings. Whilst carrying through these operations, the plants, of course, must be made secure from sudden depressions of temperature. A coating of fresh tan of about six inches will suffice to plunge them in, and they may be plunged nearly half their depth at first. All those which are robust, and possess a pot full of roots, should, if rather dry, (which they ought to be at this period,) receive a watering with weak liquid manure, and shortly after receive a shift, and it will be well if several compartments are at hand to keep the fresh-shifted ones by themselves, for the sake of system.

A temperature of 60 degrees minimum should now be secured to the succession stock, whilst in this, as in most other cases, the fruiters rising, or swelling off, will need 10 degs. more. Syringing may be applied in a very slight degree on sunny afternoons, twice or thrice a week, to the successions, providing an advance of 5 degs. of solar heat can be shut up for an hour or two. The fruiters, except those in *flower,* will require it a little oftener; taking care, *however,* to observe a rule laid down in the preceding parts of this work, viz., to let the former syringing evaporate from the axils of the leaves before supplying more. The fruiters should be allowed a great advance of solar heat in the afternoon: the temperature may be safely carried to 80 degs., or even 85, from three o'clock until five, if by solar heat.

The only course henceforward is to continue to increase the heat in a justly corresponding ratio to the increase of light; for this, after all, is the only true standard. Those who can thoroughly understand this great principle will need few other rules to guide them.

With increase of temperature, atmospheric moisture must also increase, and be made to bear the same relation to heat that heat does to light. These matters being established, the next thing is to watch daily the bottom heat: this has always been an ill-defined matter; and, instead of laying down any given number of degrees for any period, we would say, to generalize the matter, let the bottom heat be always about 10 degs. in advance of the average atmospheric temperature; which latter, as we before observed, will have in the main to be ruled by the amount of light.* Thus, in January—

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* See p. 115 of vol. I. for some observations on this point.

ATMOSP. TEMP.
DAY. NIGHT.
Fruiters.. 70 — 63=133 degs.
Or mean about.... 66
To which add 10
Gives for bottom heat 76

Successions 60 — 56=116 degs.
Or mean.......... 58
To which add 10
Gives for bottom heat 68

We cannot but think that this mode of computation will exceed all dry rules, especially for the amateur, or those who have all to learn on the subject of pine-culture; and by taking the intensity of light as the basis of all the operations, little harm can ensue, and the whole matter will possess more interest.

Mr. Hamilton is very averse to what is called a lively bottom heat; and, indeed, so are most of our best gardeners. Mr. Hamilton seldom allows the bottom heat to rise to more than 84 degs., which is about his maximum even in the height of summer: he depends more on the continuous action of a great volume of undisturbed fibres, together with a great amount of unmutilated foliage, for he seldom removes a leaf for the sake of top-dressing, unless quite decayed.

[*March*—Still further increase the temperature and humidity in the fruiting house, giving also more liberal supplies of water and liquid manure. The perforated water pipes are to be taken advantage of pretty freely on bright days, and all the arrangements assume a forcing appearence. At Bicton, the night maximum rarely reaches 68 degs. in this month, but ranges about 65 degs., a degree or two under or over, according to the light received by day; if two or three bright fervid days succeed each other, Mr. Barnes occasionally advances by night the heat to 68 degs. or thereabouts.

In the Succession Pit, too, they attempt to advance a little by turning the linings lower, maintaining, if possible, by night a heat of about 60 or 62 degrees, admitting at the time air, and a light covering with a single mat, which is left off altogether by the middle or last week in the month, and the linings continued well topped up with the previous year's dried short grass and kindly worked leaves, &c.

APRIL.—In the fruiting structure the degree of heat is still advanced a little. About the end of the month its usual night temperature standard is 68 degs., if there occurs a succession of light days, but if dark and stormy, ranging a degree or two less. Humidity and liquid manure, too, are now applied pretty liberally over the whole surface of the fruiting structure, plunging materials, as well as to the base of the trunk and *roots of the plants*; always, of course, in a diluted, clarified condition. A soft humid atmosphere is now fully maintained both night and day, but the hot water pipes, or heating apparatus, are never watered to raise a steam when hot; this being thought to be entirely opposed to nature, as she never applies soaking or hasty showers or storms while the sun is fervent and scorching, but the sky or atmosphere is generally modified by clouds or vapour to shade the earth.

Succession Plants.—To these the heat of course naturally increases at this season, as that of the external atmosphere also increases; therefore the plants in this structure should now be making rapid growth, and, consequently, have liberal supplies of water and syringings in suitable weather. Apply it over the whole structure, plants, surface of the plunging materials, &c. The more heat applied by lining, the more liberally can air be given to maintain the plants sturdy and healthy. If the night atmosphere in this structure can be maintained at about 65 degrees with air, so much the more in the plants' favour.

MAY.—In the fruiting structure this is a favourable progressive month. Heat may be increased to 70 degrees by night, with abundance of humidity, and liquid manure be given in greater abundance and stronger. The surface of the plunging materials *and the* whole structure should be continued moist, *but not flooded* with wet. Admit air liberally, and apply with moderation the perforated water pipes at night, after scorching clear days have prevailed. Shut up early, and apply air early of a morning, but never syringe about the plants in a morning or in the day time while the sun is shining powerfully. This has a very different effect when the house is shut up early of an afternoon, and abundance of humidity at once applied to all parts of the structure.

Succession plants, also, this month should have a liberal heat, from 67 to 70 degs. at night, with air, and abundance of kindly humidity, of syringing, and application of good bottom waterings.

June.—*Fruiting Structure.*—We are now come to the summer months, when the heat at night may reach 75 degs., with liberal applications of kindly humidity, of bottom and surface waterings, and abundance of air methodically admitted, night and day.

These directions hold good also for July and August, with an increase of air as the season advances. At Bicton they admit air very liberally indeed, both night and day, particularly in the latter month, often having the lights half off.

Succession plants also now should have abundance of heat, air, and humidity: if properly applied, their progress will be astonishing. The day heat, of course, is *always, to* a great extent, to be regulated *by external circumstances.* Shading is an injury undoubtedly to well-rooted healthy plants, and is in no way required if our directions are carried out; and should in these times only be heard of as a thing once in practice, but now only to be found in the corner of curiosities.]

The summer management is very simple. The bottom heats must be closely watched, and if they advance too high, refer to Mr. Barnes' directions in the preceding pages. Nothing can be better than the directions there laid down; therefore repetition is needless. As the young plants get full of roots, let them be shifted, not minding what period it is; and, above all things, give abundance of air to growing stock, about which so much has already been said.

In the course of June, July, and August, the growing stock will, when full of roots, require abundance of water; and liquid manure may be given at each watering, provided it is perfectly clear and not too strong. We will offer a few words of advice at the conclusion about this treatment.

Through the hottest part of the summer the fruiters will enjoy a vast amount of solar heat, providing the amount of moisture in the atmosphere and a due circulation of air can be made to keep pace with it. These, too, will benefit by the application of liquid manure, which may be used in a similar way as that for the successioners. Some good gardeners use ng in intense sunshine, and some equally good t ;—we are of opinion that where much shading be had recourse to, it is an argument of either state of root or of insufficient structures—inient as to a proper supply of atmospheric mois-

may here be permitted to offer a few remarks e ripening process. Every one admits that the should be in a drier state at this than at any period: we would, however, direct attention to er and equally important principle, long since nised by the late celebrated Mr. T. A. Knight, rinciple we allude to is that of slow ripening, t least, not a hurried one. We have always melons, peaches, &c., much higher flavoured ripened slowly; and any one who has turned trawberry-pots out of his houses rather premain the month of February, into cold pits or s, must have been struck with the vast increase vour under the latter circumstances. When we der, however, that the secretions which give flato the fruit must, under all circumstances, rea given time to be complete in, it is no marvel; t becomes evident that all hurry in forcing bethis point is at least supererogatory as far as r is concerned.

AUTUMN ARRANGEMENTS PREPARATORY TO THE COMING WINTER.

So various are the means at hand to grow pines, as well as the chosen routine of management in various places, that is is somewhat difficult to say how pines must be wintered.

It becomes necessary, however, in the end of October, to lay down a scheme for their winter's management. One thing is really necessary in all cases; and that is, as observed in the early part of this Calendar, to endeavour to get the fabric of quick-grown plants solidified by the last remains of autumn sunlight. This must be, in the main, accomplished by a most free circulation of air, and by suffering both bottom and top heat to come quietly downwards in the scale, without any unnatural attempts to accomplish any thing beyond the well-being and sure preservation of the plants.

Where the young stock must be preserved in ordinary pits or frames by means of fermented material alone, some previous care is necessary. In such cases the bed should be renewed by fresh fermenting matter, and the early fallen autumn leaves blended with a very small amount of hot manure, and fermented once before use, may be resorted to for this purpose. *However,* all this is not for the production of *unnatural bottom* heat, but to produce a durable bed, which, with due protection from linings, will never be very hot or very cold. And here we would say, do not force the body of the bed through the winter, but rather endeavour to heat the walls or boards, and thus to produce an atmospheric heat independent of the proper amount of bottom heat: this we would do in order to be enabled to give all the air possible during the winter; thus keeping a solid texture in the leaf. Young stock wintered thus should not be watered late in the autumn, especially the black kinds. If the pots are pretty well filled with roots, one good general watering with clean water (for no excitement now may be permitted in dung pits,) properly administered, in the end of October, will for the most part carry them through until January. Some few, very full of roots, especially of the Queen kind, will perhaps require a little water once or twice during the winter.

As young stock in houses or pits, where there is piping or flues, will enjoy less atmospheric moisture of a permanent character, means must be taken to supply it, or to water rather more frequently. In such cases there is not, at all times, an absolute necessity for removing the bark bed in the autumn, as suggested for the dung pits; a little more tan forced amongst the pots will frequently carry them safely through where the only object is to get them wintered safely.

Fruiters up and swelling will require both a livelier bottom heat and rather more water. More atmospheric heat will also have to be applied, in proportion to the end in view, as described previously; taking care to let it at all times, both night and day, bear a just proportion to the light. Above all things, however, with these, avoid aridity of atmosphere: a most liberal supply of atmospheric moisture must be provided even in winter, not by syringing—although this may sometimes be practised—but by watering the tan surface, floors, walls, &c., rather frequently.

[SEPTEMBER.—The autumn fruiters and fruiting plants for early fruiting, the former placed at one end of the structure, must have the humidity somewhat modified, with applications of tepid water, with a little liquid manure added, to be still pretty liberally supplied both at bottom and by syringing all over. Air is now to be given, and during the two first weeks in OCTOBER still more liberally both night and day. The temperature of the structure we but little regard at this season, but allow it to modify with the season, by the application of a gentle fire only for a few hours of an evening to dry up the damps. The interior atmosphere of a morning in the stove at Bicton is often pretty nearly of the same temperature as the external, and the strength of the plants is thus very much increased; the fleshiness of the foliage and stoutness of their trunks augments very fast, and the fruit weighs astonishingly, according to their diameter. At the end of October we modify the application of heat and air—but continue air to some extent both night and day; the night heat at the end of this month, is reduced to rather below 65 degs.

Succession Plants must receive a similar treatment to the above, from September to the middle of October, as regards the modifying the humidity, with abundance of air night and day, but in neither must the surface of the plunging materials be allowed to become dry, or the plants to be in want of water at their roots.

November.—In the *Fruiting Structure* still continue the modification of humidity, airing, and bottom watering. We reduce the temperature of the atmosphere down to pretty nearly 60 degs., still admitting air night and day until December. Except during gales and extraordinary rough weather, we do not shut up at night until about the middle of this month, when the heat and humidity is modified down to what has been directed for January.

Succession Plants.—The atmospheric temperature for these is still modified, also the humidity of the air is reduced at this season, as the light declines to the degree already given for January. The heat in the Bicton pits is now applied at top to the greatest extent, by topping up the linings, and not turning them lower than the surface of the plunging meterials, but *always, if possible,* maintaining a liberal supply of air at night. We commence covering with a single mat at the beginning of December, and in severe weather add a little refuse straw or hay, so as to admit of giving the structure air, to allow the escape of any superfluous vapour, and to maintain a healthy sturdiness of growth.]

We fear we have been rather too copious in our observations; so various, however, are the structures employed to grow pines, that it is a difficult matter so to write as not to mislead.

We will conclude this section with a few remarks on the *harvesting of soils*, as it is aptly termed by Mr. Barnes, and which might have been inserted on the same page with his remarks. We consider a dry March the most eligible period: a winter's frost will be found a good preparation for this process. Next to March, we would choose September; but, whatever time be chosen, dry weather for this operation is indispensable. The turf should be piled up in sharp ridges, so as to exclude the rain; and if a slight coating of thatch could be placed over it, so much the better. Materials thus harvested—grass and weeds the more the better—will be in a fine mellow state in about six to nine months; if it lays longer it begins to loose texture.

We use only one kind of *liquid manure* for this *and all other* purposes; not because we think nothing can excel it, but because it is very easily obtained. Urine is collected and allowed to become stale; soot water is made in a tank adjoining the former; when skimmed and quite clear, the two are mixed equally together, and guano is added after the rate of about four ounces to a gallon of the above mixture. In using it we have the whole as clear as wine: this we hold of paramount importance; and we merely colour the tepid water with it, putting about a pint of the prepared mixture to a large water-pot full of clean water.

In conclusion, let it be borne in mind that the true basis of a continual succession of fruit is to be sought in a frequent succession of suckers and frequent shifts.

Mr. Errington subjoins a monthly table of temperatures for the successioners and the fruiters; which, he says, may in some degree serve to guide those who are totally inexperienced in pine culture. It must, however, be borne in mind that much liberty may be taken with the temperatures here given according to the state of the weather; and we beg to request that our view of the most desirable temperatures may be referred to at p. 5 of this volume.

MR. ERRINGTON'S MONTHLY TABLE OF TEMPERATURES.

FOR FRUITERS.

	DAY MAX.	DAY MIN.	NIGHT MAX.	NIGHT MIN.
January	70	60	62	55
February	73	64	65	58
March	80	70	70	60
April	84	70	70	62
May	86	70	72	65
June	88	70	73	66
July	90	73	74	67
August	88	70	73	66
September	80	68	70	63
October	75	65	67	62
November	70	62	65	60
December	66	60	60	54

FOR SUCCESSIONERS.

	DAY MAX.	DAY MIN.	NIGHT MAX.	NIGHT MIN.
January	60	50	55	50
February	63	53	57	53
March	66	60	62	56
April	70	62	65	59
May	75	65	68	63
June	80	68	70	65
July	85	70	70	65
August	83	68	70	63
September	75	60	66	59
October	68	58	60	57
November	62	56	57	54
December	56	50	55	50

Mr. Dodemeade has also communicated a calendar of pine culture to one of the gardener's associations for mutual instruction established in the vicinity of London. It chiefly agrees with those of Mr. Errington and Mr. Barnes; but as it contains some useful hints, we print it almost entire. Where his temperatures differ from those already given, we would forewarn our readers that we abide by the latter.

In *January* it is necessary to ascertain the condition of the plants that were potted in their fruiting pots in August; if they have progressed favourably, the pots will be full of healthy roots: the bark bed, or other fermenting material, if employed for bottom heat, must be examined, and renewed with fresh fermenting material; it will be necessary to pay particular attention to the renovation of such bed at this time, that no accident may occur to the plants from too high a temperature to their roots, which would be fatal at this stage of growth. The roots of the plants being close round the sides of the pots, they are in a situation very much exposed to danger. Be particular that the plants do not suffer by want of water, or anything necessary to their well-doing, as the plants are shortly to realise the expectations of the operator or prostrate his hopes. The temperature of the house this month should be maximum, day, 70 degs.: minimum, night, 60 degs. It will be necessary to use a *little judgment in* watering, for if this element is supplied too liberally at this early season, in connection with a brisk bottom heat, the plants may start into growth, and their fruiting be lost for the present.

In *February* the temperature may be advanced to 75 degs. by day and 65 degs. by night. The principal part of the plants should shew their fruit this month, and strict attention must be paid to give them every encouragement: they should be looked over daily; and when the centre leaves are perceived to be spreading outwards, it is an indication of the embryo fruit emerging from the heart of the plant. The soil in each pot is to be examined as the fruit appears. If the soil is dry, give a copious watering, sufficient to thoroughly moisten it; this greatly assists the plant and the swelling of the young fruit, as will be apparent at the time of flowering; it will then have a stiff, stocky appearance, setting close in the centre of the plant. The plants that are tardy in showing fruit should have a less copious supply of water towards the end of the month; but Mr. Dodemeade justly condemns the starving system, as practised by some growers, who withhold water altogether, and lower the temperature of the house; by these means forcing the plants into fruit at the expense of size and quality, for it comes small and puny, with a large disproportioned crown, mounted a foot above the plant, and requiring that support in infancy which should be only admissable when the fruit approaches maturity.

In *March* keep the temperature of the house as in February.

In *April* the heat is to be advanced to 80 degs. by day, and 65 degs. by night, still allowing a rise of 10 or 15 degs. with sun heat, with plenty of air: the humidity of the house by day is regulated by the weather; and if it is a fine and sunny morning, as soon as the pipes are hot enough, Mr. Dodemeade sprinkles them with water to raise plenty of steam, syringing also the walls and paths of the house; and if the plants are safely out of flower, he gives a slight syringing over head with tepid water, which is highly beneficial to their growth, and soon will be perceptible in their rapid progress towards maturity. Mr. Dodemeade observes, that he had seen serious consequences ensue from inattention to giving air early in the morning, before the sun shone powerfully upon the plants; the leaves and fruit became blistered and unsightly, and no after attention could remove this defect. After fine sunny mornings, if the remaining part of the day continues fine, close the house early, say at three o'clock, to retain a good degree of sun heat, raising the temperature to 100 degs., as no artificial heat, however well regulated, has such beneficial effect upon plants as heat derived direct from the sun. Syringe the pathways and bed between the plants, also the foliage of the plants with warm water: stir up the fires early to maintain a good heat until the close of the evening, when, if the night is fine and mild, the fire is to be damped up in order that the house may cool down towards morning to the minimum temperature.

In *May,* being generally a warm sunny month and vegetation in full activity, the most forward fruit swells rapidly. Pay strict attention to administer to the wants of the plants, as this is one of the best months for growing pine plants and swelling off the fruit; those that are swelling still water liberally with manure water in a tepid state, looking them over often that none may get dry, as the soil in the pots from this month till October should be kept in a regular moist condition, so as to hold in a state of solution the soluble matter contained in the soil, ready to be absorbed by the roots of the plants. From a want of due attention to this most important point of their culture, especially at an advanced stage of the swelling of the fruit, may be attributed the many disappointments experienced by pine growers, and the inferior fruit produced; attend to giving air, avoiding cold currents, shutting up early as before, and still having recourse to fires to guard against changes of weather.

In *June* many of the early fruit that were set in *February* become ripe. To insure good flavoured fruit, it is necessary to admit a plentiful supply of air early in the morning, say when the thermometer reaches 80 degs., but taking care to avoid cold currents. The paths of the house are to be well watered to saturate the air with moisture; a point in culture not sufficiently attended to, and which is often apparent in the flaccid state of the foliage after a hot day; continue watering, till the fruit changes colour, when it must be withheld from the plant, until it is cut. The plants must be freed from all suckers, except one or two at most, to be retained for stock. When it is desirable to keep a ripe fruit back for a few days, the plant may be set upon the kerb of the pit, or removed to a vinery; after the fruit is cut the soil in the pot must be stirred up to the depth of an inch, and the stool well supplied with water, and every encouragement given to strengthen the suckers.

The successional crops of fruiters have the same routine of management, but as many of them that ripen their fruit in autumn require a difference in the amount of air and water, these are regulated by the weather; if it is fine and sunny, it will be nearly the same as for the first; but if dull, cold, or wet, a diminution of each is necessary; and to swell the fruit to perfection, a little fire will be necessary on dull cold days or nights until the whole are cut. (*Gard. Journ.* 1845, 247.)

OUT-DOOR CULTURE.

If Speechley and other cultivators of the pine at the commencement of the present century could awaken and read the title of this section, they would conclude that it applied to tropical horticulture. But it is not so, for the time has arrived when the gardener can be instructed how to ripen pine apples in the open air, in Devonshire, if not in other southern counties of England. We have already stated that the Editor and Mr. Barnes, without any interchange of opinions, commenced experiments, the one in a greenhouse without artificial heat, and the other in the open air, to ascertain if the pine apple could be successfully grown and ripened at lower temperatures than it is usually believed to require. Since that statement went to press Mr. Barnes writes as follows:—

The fruiting pines turned out into the kitchen garden at Bicton, without any glass or covering whatever, are going on well at this date, June 11th, and with every appearance of having some good fruit. I entertain no doubt, should the weather prove at all favourable, we shall get them of a most excellent colour and flavour in the autumn months. We have turned out several varieties, but the greater part of them are Queens, with a plant or two of Black Jamaica, Montserrat, Enville, Moscow Queen, Anson's

Queen, and Black Antigua. By the progress they have hitherto made and their present appearance, I can venture to state, without any doubt, that we shall cut a score of Queen pines from the open kitchen garden, between this date and the 29th of September, that will weigh in the aggregate 60lbs. This will be a novelty, and a case unparalleled, we believe, in this country. If this is discredited, parties are invited by Mr. Barnes to visit Bicton and examine for themselves. The mode of treatment is as follows:—We cut a trench, forming a bank on each side of it; and then, at the end of May, place the plants in the bottom on three bricks, filling up round the pots with some well-wrought leaves. We then cover the surface of the leaves, and the banks on each side, with charred hay, Mr. Barnes considering this does best for absorbing the heat, retaining it, and giving it off in a gradual, wholesome manner. We can see no reason why pines should not do turned out as well as cucumbers, melons, and many other exotic plants, perennials as well as annuals. Mr. Barnes adds, that he is in no fear of the West Indian cultivators surpassing us for a time, by what he can already observe.

DISEASES.

We have been very desirous of stating our opinions generally upon vegetable diseases, but until now have never had a few pages to devote to the subject. The desire arose from the conviction that a knowledge of principles applicable to plants generally affords light and guidance, without possessing which the gardener must be a mere empiric. In none is he usually more so than as regards the diseases to which his crops are liable. Numerous as are these, and destructive as they are to his interests, yet no subject connected with his art has obtained so little attention, and never was even trivial attention followed by benefit less important. The reason of the deficiency of benefit is not difficult to explain.

Common experience teaches us that diligence and perseverance, directed by judgment, are the essential preliminaries to success. In examining—in searching for the causes of the diseases and decay of vegetables—we have fewer guides, less assistance from the individuals affected, than we have from a diseased animal; fewer symptoms marking the commencement, or seat of the evil; yet where is the cultivator who ever took a fraction of the care exercised or a decimal of the attention to discover the cause, the progress, or the cure of one disease that sometimes brings ruin by the destruction of his hoped for harvests, as he does to detect the disorder of, and the panacea for, some miserable pig? Diligence, perseverance, and judgment, then, have never for any length of time been directed to the diseases of plants; they are yet without their Æsculapius. The subject is one of difficulty, but it is commensurately important; difficulty is very far distinct from impossibility; and the importance of the research is a stimulus to exertion. Human knowledge is acquired by observation and experience; that is, by conversing with the things about us, by noticing them attentively, and subsequent reflection. Every cultivator is capable of doing this; and if, when he found his crops diseased, he would reflect and record from what soil he attained his seed, how and in what weather it was committed to the ground; its subsequent culture; the crops that preceded; the treatment of the soil; the seasons, whether wet or dry, or severe, through which it has vegetated; with any miscellaneous observations that his own common sense might dictate, vegetable medicine would soon advance more in one year towards that state of reasoned knowledge that deserves the name of science, than it has done during the last century. As observations multiply, the adjutant sciences, Chemistry and Botany, will contribute and apply their improved stores *of information*; and if few specifics for the *diseases of plants* are discovered, we are quite sure the causes of disease will be better ascertained, and every one is aware that to know the cause of an evil is the most important step towards its prevention.

It is a very important preliminary to the study for which we would gain the attention of practical men, that they understand the nature of plants; of those organic creatures whose diseases they would obviate; for an ignorance of, or an inattention to this, is one of the causes that so little progress has been made in this branch of natural philosophy. It is absolutely necessary and important for them to understand fully that this part of the creation, the very grass they trample upon, is so highly organized, so exhibiting intimations of the functions more highly developed in the superior animals, that it is not possible to point out where animal life terminates, and where vegetable life begins: the zoophyte connects the two kingdoms. It is absolutely necessary, we think, for this to be understood and felt by those who enter upon the investigation of vegetable diseases, because we have a strong opinion that these in many, very many instances, are caused by the plants which they infect being treated as if they were totally insensible, inorganic matters, scarcely more susceptible of injury at some periods of their growth than the soil from whence they partly derive their sustenance.

To determine the question whether plants possess *a degree* of sensation is not so easy as many persons may believe. "It is as difficult," says Mr. Tupper, who has written ably upon the subject, "to ascertain the nature of vegetable existence as to determine what constitutes the living principle in animals." Darwin, by the aid of imaginary beings similar to the Dryads and Harmadryads of the classic mythology, has raised plants to a position in the order of nature superior to that to which animals are entitled. Other philosophers, taking a totally antagonist opinion, estimate vegetables as bodies, only somewhat more organised than crystals, but, like these, entirely and exclusively subject to chemical and mechanical changes.

The above opinions are equally erroneous, as will appear from the facts arranged in the following pages. It might easily be made to appear that the gradation from reason to instinct, from instinct inanimation, is as gradual as the transitions of light from the noontide to the midnight of a summer's day; but these few remarks must be confined to that section of creation that commences from the close of the animal classes in the zoophyte, and terminates where inorganic matter commences in the crystal; and the details must be specially directed to demonstrate how closely it approaches, how distinctly it is divided from, the former.

Let us first consider the comparative composition of animals and plants demonstrated by the researches *of chemists. Their* constituents are identical:—

carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, acids, alkalies, earths, and metals are the common components of both. Nitrogen has been considered by some chemists as the constituent, marking by its presence animal from vegetable matters; but the distinction fails, inasmuch as that from some animal matters it is absent; whilst in the gluten of plants—a chief constituent of wheat—in all seeds, and in the whole frame of the tobacco, it is present.

If we follow the above chemical bodies through their combinations, we shall find that these in animals and plants are closely similar, and in both are equally numerous and intricate.

Of acids there are contained in

ANIMALS.	VEGETABLES.
1. Sulphuric	1. Sulphuric
2. Phosphoric	2. Phosphoric
3. Muriatic	3. Muriatic
4. Carbonic	4. Carbonic
5. Benzoic	5. Benzoic
6. Oxalic	6. Oxalic
7. Acetic	7. Acetic
8. Malic	8. Malic

and others equally numerous in each, but not common to both. Of the earths and alkalis, lime, magnesia, silica, soda, and potass, are found in each class. Of the metals, iron and manganese are their conjoint constituents.

If we follow the two classes through their more *compound* constituents, we shall find the analogy still holds: they contain, in common, sugar, mucus, jelly, colouring, and other principles, gluten, fibrin, oils, resins, and extractives. The functions of animals and plants are similarly closely analogous.

Animals take in their food by the agency of the mouth, and prepare it for digestion by various degrees of mastication or attrition, as in the gizzard of birds. In this they differ from plants, but these have this compensation, they imbibe their food in a fluid form, and consequently in a state of the finest possible division. Animal and vegetable remains are their common food, plants having this superiority over animals, that, as they only absorb the soluble and finer parts, they are not obliged to throw off the grosser constituents which appear in the excrement of animals, though there are excretions given off from the roots of plants differing probably in every genus. In the animal stomach the food undergoes an extensive change, being reduced to a pulp of greater specific gravity, and being altered entirely both in taste and smell. In the lymphatics of plants, which may be considered their primary organ of digestion, their food or lymph undergoes a change precisely similar; its colour and flavour are altered, and its specific gravity increased.

From the stomach the animal's food passes into the intestines, is there subjected to the action of the *bile, and converted* into chyle, the nutritive part, and excrementitious matter. In their passage through the intestines the chyle is absorbed by the lacteal vessels, and is conveyed into the blood; by the heart, the mingled fluids are propelled into the lungs, to be there exposed to the action of the air. The vital fluid there changes its purple hue for a florid red, loses a portion of its watery particles and carbon; the latter combining with the oxygen of the atmospheric air in the lungs, and being breathed forth in the form of carbonic acid gas.

As plants in their food take in no gross, unnecessary ingredients, it is obvious that no process like the biliary operation is required. The lymph or sap, proceeding at once along the branches, is poured into the leaves, the very lungs of plants. There, as in the blood, its colour is changed, oxygen is emitted from it during the light hours of the day; but carbonic acid gas is thrown off during the night, and at all periods a considerable quantity of water.

From the lungs, by the agency of the heart, the blood is propelled through the arteries over the whole animal system, supplying nourishment and warmth to all the parts, and where, by these abstractions, it is again converted into purple or venous blood, it is returned by the veins to undergo the changes that were described as being effected by the lungs.

The sap, after exposure to the action of the air in *the leaves*, is returned by another set of vessels situate in the bark, ministering to the growth and support of the whole plant.

Such is the close assimilarity in the digestive and circulatory processes of the two classes; an assimilarity which obtains in all the other functions enjoyed by them in common. In respiration, the air inhaled through the mouth and nostrils proceeds immediately to the lungs and acts upon the blood; in plants, when it is inhaled by their leaves, it operates instantaneously upon the sap. The changes that take place have just been imperfectly noticed, and we have no space to do more than add, that the oxygen of the atmosphere is the gas essential to the existence of animals; but it is its carbonic acid that is quite as important to vegetables. They may be considered the vital airs of the two classes. If animals are placed in a situation where they inhale pure oxygen, their functions are highly and rapidly increased; but it is an exhilaration which would soon terminate in exhaustion and death, if breathed by them for any extended period. So plants will flourish in an atmosphere containing 1-12th of carbonic acid, but if it much exceeds this proportion, they are rapidly destroyed. During sleep, animals respire less carbonic acid than during their waking hours; so plants emit little or no oxygen during the night.

After an animal has enjoyed the regular course of *its functions for a period* varying in its duration, the time at length arrives when decay commences. The wasted, enfeebled, and relaxed form gradually declines, until death finally closes all activity. The body then becomes contracted and rigid; the skin exchanges the ruddy tinge of health for death's pallid hue. Decomposition speedily ensues, will all its offensive phenomena; and finally, the only permanent remains are the skeleton and a small amount of earthy matter. The same characteristics attend the last period of vegetable existence. Plants may flourish only for one season, or their lives may be extended through centuries of years, yet decay eventually comes over them; becoming more and more stunted, weak, pallid, and ragged, they eventually cease to live, become contracted and rigid, and pass through the same phases of putrefaction that are exhibited by the animal carcass. In both there was a time when warmth and exposure to the atmosphere were the sources of vigour—these now become the agents of destruction; they were once able to resist and to overcome the laws of chemical affinity—they now are destroyed by their attacks. What causes this most striking change? What antiseptic agent have they lost? There can be but one reply. It was their vitality. Now, let us examine how the vitality of plants in other respects resembles the vitality of animals, and we will confine this examination to two or three points.

Plants are excitable. Light acts upon them as a stimulus. Every body must have observed that plants bend towards the direction from whence its brightest influence proceeds. M. Bonnet, the French botanist, demonstrated this in some very satisfactory experiments, by which he shewed that plants grown in a dark cellar all extended themselves towards a small orifice admitting a few rays of light. Every flower almost has a particular degree of light requisite for its full expansion. The blossoms of the pea, and of other papilionaceous plants, spread out their wings in fine weather, to admit the solar rays, and again close them at the approach of night. Plants requiring a powerful stimulus do not expand their flowers until noon, whilst some would be destroyed if compelled to open in the meridian sun. The night-blooming cereus unfolds its flowers only at night. Heat also acts as a stimulus upon plants. M. Duhamel observed, that during moderately fine weather the footstalk of a leaf of the sensitive plant (*Mimosa pudica*) stood in the morning at an angle with the lower part of the stem of 100 degs.; at noon, the angle had increased to 112, but at night had fallen to 90. If a leaflet of this plant be but slightly touched, it immediately shrinks away; and the impulse being communicated, each pair of leaflets on the branch collapse in succession; and if the impulse be strong, the very branch itself will sink down by the side of the stem. *If an insect alight* upon the upper surface of the

Venus's fly-trap (*Dionœa muscipula*), its sides spasmodically approach each other, and crush to death the intruder. If the inner side, near the base, of any one of the anthers of the barberry (*Berberis vulgaris*) be gently touched, as with a bristle or feather, it instantly springs forward and strikes against the stigma. But the strongest indication, says Mr. Keith, of the existence of a species of sensitive principle in a plant, is, perhaps, that which is exhibited by the *Hedysarum gyrans*. It is a native of India, growing on the banks of the Ganges. Its leaves are ternate, the middle leaflet being larger than the lateral ones. All of them are in constant vibratory motion; sometimes equably, at other times abruptly, but without any unison in the movements. If their motion be prevented, by grasping them in the hand, they renew it more vigorously when the confinement is removed, but by degrees subside to their natural rapidity of motion. This motion does not depend upon the application of any external stimulus, for it continues throughout the night as well as the day. It is most active during a warm day, the leaves then having an additional tremulous motion. (*Keith's System of Physiological Botany*, ii. 464.)

Instinct seems to be a characteristic of plants, from the following phenomena. Some of them close their flowers invariably when rain is approaching. Others have an unalterable direction assumed by them when climbing. No force can make one twist round a pole from left to right, if its natural direction be from right to left. If a garden pot be divided by a vertical partition, and one half filled with a poor sterile earth, and the other moiety with a rich fertile soil, a geranium or other plant placed in this pot, with some of its roots over the sterile soil, and the rest of the roots over the fertile soil, those over the first named portion will gradually change their direction until they can also get into the richer pasturage. Instances have been known of the roots of trees piercing and destroying walls in their efforts to attain a more preferable soil than that in which they were planted. M. Saussure relates that he placed some plants of Polygonum persicaria and Bidens cannabina in water containing acetate of lime in solution. These plants then imbibed, with the water, a portion of this salt; but when they had the opportunity of selection given them, by dissolving in the water some common salt, glauber salt, and acetate of lime, they absorbed the two first named, but rejected the latter entirely. (*Saussure's Recherches*, 247—261.)

From the foregoing facts, without arguing that they demonstrate sensation to exist in plants as acute as that possessed by the higher or more perfect classes *of animals, yet* they certainly are satisfactory *evidence that plants* probably are nearly as sensient as the zoophyte, or even as the polypus and the hirudo—animals that may be cut into pieces, and each section become a perfect individual; animals whose heads may be taken off and grafted upon other bodies; animals that may be turned with their outsides inwards, and yet without any apparent inconvenience. If plants be endowed with sensation of the most limited degree, it explains the cause, throws light upon the prevention of many diseases that affect those which are the object of cultivation; warns the tiller of the soil from the late performance of many of his operations, and teaches him generally to be less violent in his field practice. If a grape vine be pruned too late in the spring, the bleeding or effusion of sap has been known to be so violent, that the tree has died from absolute exhaustion. Stone fruits, if severely wounded, are frequently destroyed by the inroads of a disease resembling in all its characteristics the cancerous affections of animals; and we have known a whole crop of wheat affected with a swelling of the stem or culm, evidently caused by an extravasation of the sap from its ruptured internal vessels, owing to the roller being passed over the crop when of a growth somewhat too forward.

After these prefatory remarks, intended to save from *fundamental* objection the opinion we entertain, that *most, if not* all the diseases of plants, are connected with or arising from causes affecting their vital power—for these remarks exhibit facts and reasons establishing the existence of such power in plants—we will proceed to consider in detail the most prevalent diseases of the plant now under consideration.

Ulcer or Canker.—This class of disease, to which in some form every vegetable is liable, affords a strong demonstration of the vitality—the sensitive energy of life—existing in plants. In dead organic matter decay is total, and pervades the whole mass simultaneously, but when decay or decomposition attacks a living plant, or a living animal, it is local—and the decomposition is restrained within bounds by the wondrous antiseptic power of the vitality in the other parts of the plant. The pine apple affords an illustration of this phenomenon.

Its suckers taken off from their parents before their lower ends are brown—that is, before the woody fibre is sufficiently perfected—are very liable to canker or ulceration in that portion placed within the ground. The same disease often attacks more perfectly matured suckers if these are supplied at first too liberally with water. It is a curious phenomenon, that the upper portion of the leaves of suckers, the basis of which are perfectly ulcerated, continue as green, or even greener than those of *plants undiseased.* The obvious prevention of this ulceration is to plant none but well matured suckers, and to avoid giving them excessive moisture.

Nor is the ulcer or canker confined to the sucker of the pine apple, for established plants, if improperly managed, are equally liable to its ravages. Mr. Barnes says that it is the most destructive disease to which the pine apple is liable. It makes its appearance, in the first place, in the centre of the leaves at the base, passing up the centre to the summit, at first of a darker green colour than the other parts of the leaf; after which, during hot weather, it changes to a ferruginous colour. If this disease is amongst the fruiting plants when they start for fruit, it generally affects the stalk that supports the apple, cripples it, and causes it oftentimes to shrivel up long previously to the fruit having reached the size it would otherwise obtain. It is true, the fruit generally colours, but remains deficient of its most essential qualification. Numbers of such fruit were to be observed in former days at Covent Garden Market and in pine growing establishments, where a strong bottom heat was cherished and considered essential, and where strong liquid manure was applied in a thick form so as to stop up the few open pores of the earth that there were under the fine soil system of culture. Of one thing we are satisfied, viz., that this disease does not appear among the pines that *are potted* in open porous heathy soil, placed on a moderate heat, and their food only applied in a clarified state or in moderate quantities. Such plants always maintain a green healthy stalk and foliage until the fruit is thoroughly ripened.

Indeed the pine apple is not subject either to disease or vermin, unless it receives a peculiar or unnatural treatment. When it is infected with either, the matter clearly speaks for itself that there is a mistake in some portion of its culture; and to obviate either, instead of shaking the plants out, brushing and washing them in a mixture of obnoxious drugs, still causing them, for a time at least, to look more disgraceful, we should recommend the system of culture to be altered to a more genial one. This being adopted and followed upon methodical principles, the pine plant, subsequently, will neither be infected with disease or vermin for any length of time.

EXCESS OF GILLS.—This occurs chiefly to vigorous plants, of which the growth has been suddenly checked. The gills of pine plants are spurious suckers shooting from the base of the fruit, or from the stalk. Sometimes the whole length of the stalk emits gills, which are very injurious to the swelling of the fruit if allowed to remain for any length of time. Our practice is to take them carefully off with a sharp knife as early as possible after they have made their appearance. *Lengthened* observation convinces us that if plants are allowed to stand dormant any time; or, if they meet with a sudden check after they are set for fruit; or if they are allowed to stand still, or come on too slowly when first set, or are starting for fruit, they are the plants which always produce gills in the greatest abundance. A healthy growing plant, or rather, we should say, a plant grown into fruit without receiving any check, rarely produces any, or but few gills. We have observed gills push forth from the stalks of pine apples, and at the base of the fruit, with two or three pips in depth of fruit to them, somewhat in the manner of the hen and chicken daisy.

EXCESSIVE CROWN.—This takes various forms. The crown may be flattened, or fasciculated, which is described by gardeners as *cockscombing;* or several crowns may be produced; or there may be only one excessively large. Each and all of these may be considered as a disease, being an excessive or plethoric growth.

The cockscombing of pines, to which, by the way, the Enville is peculiarly subject, is a deformity; and if two specimens, nearly equally swelled, heavy, and otherwise good, are placed for competition, the prize must be given against the cockscomb. But if the cockscombed is decidedly better grown than others not cockscombed, to which it is opposed, then this deformity ought not to be a bar to its winning; because it *is not* caused by bad gardening, nor capable of being prevented by good gardening, but it is an accident that no care can guard against, and one that does not at all interfere with that quality—flavour—for which pine apples are cultivated. (*Gard. Chron.* 1843, 505.) Its excessive development may be checked in the modes hereafter noticed for stopping the other superproductions of the crown, and which are thus noticed by Mr. Barnes. He says that although cockscombing is considered by some gardeners as a disease, yet that he is very far from entertaining such an opinion. There is no doubt that it is a defect or imperfection, but the cause is not yet satisfactorily accounted for. Though an imperfection or mal-formation, yet every one must have observed weighty, handsome, well-swelled fruit bearing cockscombed crowns. Very rarely among the stock at Bicton is seen a cockscombed crown. We make it an invariable rule not to save any succession suckers or crowns from such plants as have produced cockscombed fruit. When such does make its appearance, we reduce the size and shape of the crown in its early stage of growth, if possible, by cutting from each side a part of the crown or bunch of crowns, or by taking the centre or heart out of each, according to circumstances. This is done by turning a small sharp knife round inside the centre or heart of each crown. This operation is practised by us also upon single-crowned fruit, when crowns *are likely to take* the lead of the fruit, and become disproportionate. If carefully and methodically performed in due season, the operation is not only most beneficial to the swelling of the fruit, but is not in the least unsightly, as some have erroneously imagined. Indeed we have seen hundreds of crowns which have thus been dealt with, and on which a casual observer could scarcely perceive that any such operation had been performed. Now, as it can be performed without the least unsightliness or mutilated appearance, and the fruit is consequently much improved in size, shape, and flavour, every desirable advantage is gained. We know that the practice has been ridiculed and condemned, but we should imagine by those only who have not seen it put correctly into practice. We would beg to inquire of such men, why we are not assisting nature in performing her functions as much by retarding methodically the disproportionate growth of a pine apple crown, as others are in stopping or pinching out the points of geraniums and other plants, to regulate the growth of these, and produce what is now-a-days considered a superior shape as compared to the poor drawn-up, spindle-shanked, lean plants of former days? Again, why should the former be considered an unnatural mutilation any more than the other? or why should it be considered an unnatural mutilation any more than the stopping the shoots of the vine, fig, melon, or any other fruit-bearing plant?

Some varieties of pine are much more subject to produce cockscombed crowns than others. The Providence and Enville appears more subject to it than most other varieties. The Queen varieties are but rarely subject to such deformity ; at least we have not observed such to be the case.

Very Large Crowns are not admired, and to obtain smaller ones, under the circumstances of a very high temperature, combined with a very considerable amount of atmospheric moisture, artificial means must be resorted to occasionally. These means are, in the first place, to pierce, or screw out by a small instrument, the centre of the sucker, soon after the pine has done blossoming: another plan, that has been successfully practised at Oakhill, is to thrust a penknife through the base of the crown, about the same period as that before named. Such treatment will check the size of the crown ; but leads occasionally to distortion, unless the process has been very tenderly performed. This consequent distortion is, or ought to be, as a matter of taste, more unsightly than the large crown. The most reasonable way after all of keeping the crown in check, so as to avoid distortion, seems to be to give air more freely, to avoid extremes of temperature and of moisture in periods of comparative darkness, and to persist in coupling high temperature with much solar light. Whatever condition of atmosphere "draws," technically speaking, the young or growing plant, must also in degree tend to "draw" the crown. In other words, an unwieldy crown is a drawn crown. (*Gard. Chron.* 1845, 625.)

Mr. Barnes, as just noticed, adopts the following method of preventing the excessive growth of pine crowns, when by any accident a plant tries to produce them. It must be obvious that, if the pine apple plant has to feed both its fruit and a huge tuft of leaves on the top of it, (which, as our clever friend truly says, look like a baby's head with a man's hat on,) the nourishment which the plant is capable of yielding must be divided between them, and the man's hat will be formed at the expense of the baby's head. To prevent this, from three to six days after the blooming is over, he thrusts a small knife into the centre of the crown, and gives it a twist, when out comes the centre of the heart, which checks its growth without disfiguring the plant. Speechley adopted a similar practice with suckers, in order to stop their growth. (*Gard. Mag.*)

PLURALITY OF CROWNS.—Some kinds of pine apples have a greater disposition than others to throw up more than one crown, and this tendency will be greatly increased if the plants have received any check so as to have hastened them prematurely into a fruiting state. Select the centre and strongest one, which *must* be retained, and remove all the others carefully on their first appearance. (*Glendinning on Pine Apple*, 481.)

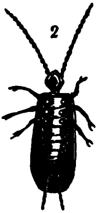
INSECTS.

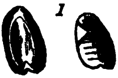
The pine apple is not an exception to the rule that if a plant is preserved in a state of healthy vigour it is but little liable to the attacks of vermin, and not at all to the inroads of some—the Scale for example—which appear to delight in diseased juices, and to be able to penetrate through weakened tissues, in like manner as the attacks of flies and fungi are similarly facilitated by putridity.

Considerable experience convinces us that unhealthiness usually precedes invermiation; and we fully believe the statement made by Mr. Nicol, that he received into his stock, plants covered with the pine-scale, (Coccus hesperidum,) without the smallest hesitation; made no effort whatever to get rid of them; and by next shifting time, in two or three months, saw no more of them. He says that he never but once tried any remedy for the scale; and as he was completely successful, he gives the recipe, which may safely be applied to pine plants in any state; but certainly best to crowns and suckers at striking them, or to others at the time of shifting. *Take soft soap, one* pound; flowers of sulphur, one pound; tobacco, half a pound; nux vomica, an ounce; which boil all together in four English gallons of soft water to three, and set it aside to cool. In this liquor immerse the whole plant. Plants in any other state, and which are placed in the bark bed, may safely be watered over head with this liquor; and as the scale harbours most in the angles of the leaves, it stands the better chance of being effectual, on account that it will also there remain longest, and there its sediment will settle. In using it in this latter way, however, if repeated waterings be necessary, the liquor should be reduced in strength by the addition of a third or a fourth part water. (*Nicol.*)

Various species of scale, of which that noticed by Mr. Nicol is one, are the only insects that materially injure the pine apple, and of these we will now proceed to take more particular notice.

Coccus hesperidum, the Orange Scale Insect, is the





Brown Turtle Insect of Speechley, the first writer who notices the insect ravagers of the pine apple. The female appears like an oval nut-brown shield (Fig. 1), and the male as a winged fly (Fig. 2). Both are highly magnified.

This species is not only found upon the pines, and most other plants which grow in hothouses, but also upon many plants which are kept in greenhouses. These insects, after they have arrived at a certain age, fix themselves immoveably to the leaves of the plant; but before that time, though they generally appear motionless, yet, on a close inspection, in a very warm day, many of them, and especially the smaller ones, may be perceived to move in different parts of the plant, being in appearance much like a turtle in miniature.

A sweet glutinous matter issues from these insects; this soon turns mouldy, and in time becomes quite black, causing the plants to appear very unsightly. (*Speechley.*)

Coccus Bromeliæ.—The Pine Apple Scale Insect—White Scaly Insect of Speechley.—It appears like a grey, elliptical, rather elevated shield, mottled with brown, and is very like the one just described. It lives on the pine apple, the justicia, hibiscus, &c. This parasite propagates throughout the whole year, and great *caution must be used* in destroying it, as the young ones, when brushed off, will ascend the plants again, and take possession of their old abodes. (*Kollar.*)

Speechley observes of it, that it seems to be exactly similar to the Orange Scale Insect in its manner of breeding. The eggs, which are discharged from the female, are pushed forward between the skin of the belly and the leaf of the plant to which the insect adheres; in consequence of this, the skin of the belly becomes less distended, which enable the insect to afford a larger covering for the eggs already excluded. When the eggs are all discharged, the skin of the belly retreats close to the back of the parent insect, which then appears like a mere scale. If the insect in this state be raised with the point of a needle from the leaf, a number of eggs may be perceived under it, of a pale red colour, and very transparent, not unlike the roe (or eggs) of fishes; but with this difference, that they are not connected by a membrane, but loosely packed together. The mother not only thus broods over her eggs till they are hatched, but continues to protect her young for a considerable time after, and either dies during the time she is performing this last office for them, or very soon after.

The males of both the above species are much less than the females, and appear very different from them; the latter, except just in their infant state, *never* assuming any other form than that of a scale, already described; whereas the males of both kinds, in their last state, become flies; but neither of them can probably do any injury to the pine plants whilst they are in that form.

The length of the fly, or male, from the head to the tail, exclusive of the wings and those long hairs which are so characteristic of the flies of this kind, is about the thirteenth part of an inch; and the length, including the wings when folded one over the other on the back of the fly, exclusive of the hairs before mentioned, is about the eighteenth part of an inch. (*Speechley on the Pine Apple.*)

Coccus Adonidum.—The Mealy Bug; White mealy crimson-tinged Insect of Speechley.

This species differs from the preceding one in not being shield-shaped; it resembles the woodlouse, is reddish, and strewed with white dust. At the sides of the twelve segments of the body it is provided with small tubercles. The male is slender, and gnatlike, with two rather broad wings, and two long brush-shaped tail filaments.

This foreign species has become a native of hot-houses, to the great annoyance of plants and gardeners. It attacks a number of species of plants, particularly the soft-leaved dicotyledonous kinds, such as the coffee-tree, Justicia, Ruellia, Cestrum, &c.; it is also *found plentifully* on Musa, Canna, Renealmia, &c.

Kollar observes of this pest, that though it may be brushed off, yet it must be with soft brushes; and care taken not to crush the insects on the plants, as their juice greatly injures the leaves. Brushing them off must either take place at a distance from the hothouse, or they must be killed immediately, otherwise they will creep up on the plants again, as their feet are effective even when they are old. (*Kollar.*)

The two former species are undoubtedly oviparous; this seems, on the contrary, to be viviparous. It is most probable that the young ones remain some time in the mealy down of the mother, till they have acquired strength, and are arrived to such a degree of perfection as to enable them to support themselves—when they forsake the parent insect, and disperse themselves to different parts of the plant.

When this species is first perceived on the leaves of the pine, it appears to be nothing more than small particles of meal, or powder, collected together; but in a few days it assumes the form of a louse or bug, thickly covered with a fine meal or down, of an oval form on its upper, and very flat on its under side, from whence proceed its legs, which are six in number. These, as well as many other particulars in the above description, are not to be distinguished without the help of a magnifying glass.

This last described species is of a more pernicious nature than the former; it attacks every part of the plant, from the top of its fruit even to the most extreme parts of its root. These animals wedge themselves in between the protuberances of the fruit in a most surprising manner, so as not to be got out without great difficulty, which not only makes the fruit appear very unsightly when it becomes ripe, but, by robbing it of its nutricious juices, is the cause also of its wanting flavour and being ill-tasted.

But the bad effects of this species on the roots of the plants are yet of far more consequence; for there, even at the bottom of the pots, they increase with an uncommon degree of rapidity, and in the end destroy the principal roots of the plants. The common method to extirpate them from this situation is by shifting the plants in their pots; at the same time, cleansing their leaves and the roots, which is usually styled a dressing. Decoctions made from tobacco, wormwood, walnut-leaves, henbane, and other herbs of a bitter or poisonous quality, are generally used on this occasion; and by some, snuff, sulphur, and pepper are added; but none of these appear to be of a nature sufficiently penetrating. There are insects always between the leaves in the centres of the plants, fixed so low as to escape unhurt. (*Speechley on the Pine Apple.*)

Of all the vermin we have enumerated, the white scale *is the most* formidable enemy amongst pines; *and if allowed to* get numerous, certainly has a very dirty, disreputable appearance. We believe this insect robs the plants of their sap; but even if the few practical men of former times were correct who would not admit these vermin caused any serious injury to the pine plant, yet still every gardener will allow that the treatment the plants necessarily have endured to cause them to be so infected must be highly injurious to their size and quality. According to our estimate, however, those plants in a robust, healthy condition, being never infected with such pest, those cannot be termed free from disease that are in a lean, narrow-leaved, invermiated condition, and consequently full of punctures and small ulcers.

That white scale is the kind of insect most commonly met with. It may be readily known by the most inexperienced. It exists in small white patches or spangles on the surface of the leaf, appearing glued, as it were, to the epidermis. Its depredations are not confined to the surface; the parenchyma soon suffers, and not only a derangement of the tissue ensues, but the very life-blood of the plant—the true elaborated sap—is progressively exhausted; and if tolerable fruit is produced in spite of its depredations, it merely proves that there has been a good root action to support such a waste, and that the fruit would have been much finer had the ravages been *prevented* in proper time.

About three distinct operations are practised by skilful gardeners in order to get rid of this pest. One plan is to dress the plants with a very powerful mixture; the second is to shut the plants up in a confined atmosphere, charged with the powerful gases of fresh dung, in a highly fermentative state; a third, which is perhaps the most reasonable mode of procedure, is to administer successive syringings with water heated to 130 degs.

With regard to the latter operation, a somewhat wider range should be taken occasionally, according to circumstances. The point, therefore, of 130 degs. must be taken in a relative sense: for instance, for pines in a wintering state, with an average temperature of 55 degs.—say in the beginning of January—130 degs. would in all probability prove fatal. It would therefore appear that, if the scale can only be combatted successfully by a temperature of 130 degs., another season must be sought for the operation. We must honestly confess that we never tried the hot water cure; nevertheless, under a judicious application, we should not doubt.

Why, however, not medicate the water? We should certainly add the amount of soft soap which it is known the pine will endure—say rather more than an ounce to a gallon. To revert, however, to the matter of temperature. We would advise the application of the heated medicaments either in the *beginning of* September or in the early part of April, taking care to inure the plants for some weeks to an unusually high temperature; by which means, cautiously pursued, we have little doubt that a very much higher temperature might be practised. One piece of caution should here be given, and that is, to keep a thin skreen over them, both during the highest temperatures preceding the operation, and also during the operation itself, which should extend over three days, during which time they may receive many syringings, increasing the temperature slightly each time. After all these points are duly carried out, the temperature and shading should be reduced in a progressive way. Under such high excitement it will require a week or more to bring the plants to their due position.

The next best process—indeed, perhaps quite equal to the former—is one practised first, we believe, by Baldwin, who was gardener to the Marquis of Hertford, at Ragley, about thirty or forty years since. It consists in so preparing a pit, frame, or house, as that the atmosphere for some time shall be strongly impregnated with the effluvium of rank dung steam. This is understood to be quite effectual, when properly carried out. The mode in which to perform it scarcely needs description—certainly not to pine-growers; we, however, write for the uninformed, and therefore beg to say a few words about it. It matters *not whether* the structure be a house, pit, or frame, as far as construction is concerned, only the smaller and closer the structure the more effectual will the process be. The ordinary process is to make up a pit on purpose: this is done by excavating to the depth of five or six feet from the roof at least, and by putting nearly a yard in thickness of fresh manure from the stable-door into it. The pines must not, however, be plunged, but merely set on the top; and no tan or other surfacing body must be used. They may be crammed here as thick as they can stand together; and the sides of the pit being pigeon-holed, or walled in some way, rank linings may be applied when the dung from the interior becomes weak. Some caution should be used at first, or if the dung is very new, and from high-fed horses, it may possibly overpower them. It would, perhaps, be better to give the manure one sweating before using, and to increase the bulk of such manure as an equivalent for the loss of rankness. During the operation, which may last as long as the dung continues sufficiently warm, a very close and confined atmosphere must be preserved; especially, we would say, when the very rankest of the gases have passed away, which will be in the course of about a week. The manure will then begin to require water: this will facilitate the production of a considerable amount of steam or gaseous matter, which is absolutely necessary, in order to penetrate every crevice; in fact, it should, more or less every day, be considered in the light of a stoving process. After awhile—say about three weeks—steps must be taken to cool them down by degrees, and to gradually inure the plants to the light. It is best, in this case, to have a clean and sweet pit duly prepared, with a bottom heat of 85 degs. some time previously. All that is necessary here is to take care that the plants, as before observed, are gradually inured to light, air, and, if in the autumn, to a comparative dryness of atmosphere; providing, at least, that they are to be kept in dung-pits through the winter.

The third class of remedies prescribed for the destruction of the scale insect, are powerful medicated mixtures; and from the very numerous recipes which have been recommended we select such as we know from our own experience, or from the experience of practical gardeners among our friends, have been found to be efficacious.

Mr. Griffin's recipe is:—To one gallon of soft rain water, add eight ounces of soft green soap, an ounce of tobacco, and three table spoonsful of turpentine; stir and mix them well together in a watering-pot, and let them stand for a day or two. When you are going to use this mixture, stir and mix it well again, then strain it through a thin cloth. If the fruit only is infested, dash the mixture over the crown and fruit with a squirt made for that purpose, until all is fairly wet, and what runs down the stem of the fruit will kill all the insects that are amongst the bottom of the leaves. But when young plants are infested, take them out of their pots, and shaking all the earth from the roots, (tieing the leaves of the largest sized plants together) and plunge them into the above mixture, keeping every part covered for the space of five minutes. Then take them out, and set them with their tops declining downwards, for the mixture to drain out of their centre ; immediately filling the vessel again with fresh plants, until all is finished. As soon as the plants become dry, pot them, and plunge them into the bark bed again. (*Griffin on Pine Apple*, 77.)

Mr. Mills recommends, for destroying the Mealy Bug and other Cocci, that the plants requiring to be cleaned should be allowed to become dry ; they are then to be washed in clean water, and the insects removed, as far as practicable. A tub or other vessel, capable of holding as much liquid as will allow of their being immersed, is to be filled with soap-suds from the laundry, and a quarter of a pound of yellow soap is to be added to every gallon. When the soap is dissolved, let the plants be immersed while the liquid is in a tepid state, (though it is not required to be kept in a tepid state) and allowed to remain *immersed twelve* hours. Let them then be so *placed that the* liquid may drain from the hearts of the plants; after which they may be planted, and treated as advised for fresh-potted suckers. (*Mills on Pine Apple*, 79.)

Mr. John Bowers, gardener to Lord Selsey, at West Dean House, in Sussex, destroys the bug and scale on pine apple plants by a wash consisting of three gallons of rain water, two pounds of soft soap, eight ounces of black sulphur (sulphur vivum), and two ounces of camphor, boiled together for an hour, and to which is then added three ounces of turpentine. He turns out his plants, divests the roots of their fibres, and immerses them in a trough nearly filled with the liquid, at a temperature of from 120 to 136 degs., for about five minutes. Queen and Sugar-loaf pines he finds require the highest heat stated; Antiguas and others need not have it above 124 degs., but those to which a lower temperature is used must remain double the time immersed. When taken out of the liquor they are well drained, and set on the flue of the house with the roots upwards, until they become dry; they are then put into small-sized pots, and plunged in fresh tan, with a good bottom heat kept up by dung linings. They are shaded from the sun in the heat of the day, and a little air given until they begin to grow, which will be in about three weeks from the time they are potted. The above operation may be performed between the months of February and September. (Hort. Soc. *rans. vi.*)

Mr. Hamilton gives the following as an unfailing recipe for destroying the Cotton (Mealy) Bug and White Scale:—Sulphur 8 oz., Scotch snuff 8 oz., hellebore powder 6 oz., nux vomica 6 oz., soft soap 6 oz., Cayenne pepper 1 oz., one quart of tobacco liquor; add one quart of boiling water; stir the mixture well, breaking the lumps; when cool, strain it through a rough cloth; after which it may be used at any time. Having provided a brush of sufficient length, let the plants be washed with the mixture on both sides of their leaves, allowing a portion of the liquor to run down to the bottom of each leaf. When the mixture is used for the white scale, the insects should be removed during the process of washing. After the leaves have all been washed and tied up, they must then be turned out of their pots, and the balls reduced; the trunk itself must be well washed, as the scale will sometimes have reached its very base; when it is applied for the destruction of the cotton bug, the roots also must be well washed. (*Hamilton on Pine Apple*, 97.)

The following is a receipt of the late Mr. Runciman's, who was a good pine-grower, for destroying the scale insects which infest that plant:—Boil gently together, in four gallons of soft water, 1lb. of tobacco, 1lb. of sulphur, 1lb. of soft soap, and ½lb. of nux vomica, until the quantity is reduced to three gallons. *In this the crowns* and suckers should be steeped for a quarter of an hour, after which they should be well rinsed in a tub of clean water. They should be turned bottom upwards until the wet is drained from them ; and after being potted they should be kept in a strong moist heat. Where it is requisite to dress large plants, great care should be taken to drain the water from them thoroughly, and not to wash too near the hearts. (*Gard. Chron.* 1843, 7.)

Mr. Barnes utterly abjures all medicated compounds for the destruction of the scale insects, maintaining that the best remedy is to restore the plants to robust growth. To aid the expulsion of the insects, however, he recommends that, instead of pure water, clear soot water and weak ammonia water, syringed not only over the pit but over the plants, will be found of great service.

A most effectual remedy is to brush the cocci over thoroughly twice, after an interval of a day, with spirit of turpentine.

Now all the foregoing recipes offer very powerful agents to work with, and the process, moreover is a rather tedious one. We strongly suspect that it is the soft soap which effects the cleansing. This is known to be destructive to the common apple and pear-tree scale; and it is by no means improbable that it suffocates them, by casting a sort of Mackintosh wrapper over them, impervious, in a great degree, to the atmosphere. It appears that Mr.

Hamilton reckons this equally efficacious with the cotton or mealy bug, and the ordinary white scale.

The brown scale is also known to infest pines, but somehow the latter is not so fatal as the white. Indeed, most gardeners care little about the brown.

When, however, high cultivation—or, in other words, abundance of lively roots unchecked, accompanied with a proper moisture—is carried out, the scale and all other insects will assuredly vanish of their own accord. But let a check come, and they will speedily recover their lost ground. This points out the safe character of the Hamiltonian plan. Larger pines may, or may not be, produced by other modes, but this above all others recommends itself to the amateur, and to all those who desire a succession of good fruit throughout the year, with as little trouble and expense as possible.

We certainly opine that, before many years are passed, the great majority of pine-growers will fall into this most simple and inexpensive mode; and that houses running north and south, of a flat pitch, and containing a middle walk, with a single or double row of Hamiltonian stools, planted out over tank-heated pits, will become very general indeed. A little top dressing, with frequent syringings, and a little ventilation, will be all that is necessary; and will be merely a source of amusement to the proprietor: *whilst a mere boy* or woman may attend the fire.

In conclusion, let every possible regard be paid to the permanency of the roots of the pine. It is not their excessive luxuriance at any given period, so much as their uniform and steady action: this last is the grand desideratum. In addition to this, secure a genial atmosphere, generally loaded with moisture, and accompanied by an almost constant circulation or motion.

Acarus (Erythræus) tellarius.—The Red Spider. —This pest of the gardener is very rarely found on the pine apple, and never will occur if the air of the pit is kept duly impregnated with watery vapour. Sulphur fumigations and a more free supply of atmospheric moisture will speedily remove and continue to exclude this insect.

The Red Spider cannot thrive—scarcely exist—where a sufficiency of water is regularly applied. As, however, syringing cannot be persisted in at all times, something else is requisite at those periods, when the syringe is laid by. Sulphur, then, is the best thing at present known for this purpose; but as many persons are deterred from the use of it, through a fear of its pernicious effects, we will here detail our mode of using it, by which we have been kept (we might almost say entirely) free of this pest for the last twelve years. We apply it about three or four times in the course of the year, to each house; the houses are on the average about 30 feet long, by some 16 feet wide, and we use about six ounces to each house each time, applied in the form of thick paint. The houses are heated by hot water, and the sulphur paint is applied to the under or return pipe alone. The best way is to beat a lump of soft soap, as large as a walnut, up in warm water; and to add some clay water, made by working a lump of clay in warm water until the water becomes a thin paint; then to blend this with the soap water; and finally to mix the sulphur also. The soap and the clay form a body, and prevent the sulphur washing or rubbing off. (*Johnson and Errington on the Grape Vine,* 134.)

USES.

To the Mangostein, in India, and especially by those who have eaten it in the Straits of Malacca, on whose neighbouring shores it is alone found in perfection, is ascribed the superlative place among fruits. In England, where the Mangostein is unknown, the pre-eminence of excellence is assigned to the pine-apple, and this high merit was assigned more than a century and a quarter ago, when its fruit was far less in colour, size, and flavour than at present. We gather this from the following inscription, copied from the picture *in the Fitzwilliam* Museum, and noticed by us at p. 6.

of the preceding volume. The picture, we are obligingly informed by Professor Henslow, represents a pine apple of the full size, with this contemporary inscription beneath.

Perenni Memoriæ
Matthæi Decker Baronetti
et
Theodori Netscher Armigeri
Strobilus hic [illegible]
Regio convivio dignatus
Istius impensis Richmondiæ crevit
Hujus arte etiamnum crescere videtur.
H. Watkins, inscripsit, A.D. 1720.

In the East Indies, the pine apple is so abundant that it is universally substituted by Europeans for the common apple of our more temperate climate. Thus, pine apple sauce with goose, and pine apple fritters, are the every-day preparations in the Calcutta kitchens.

The utility of the pine apple is not confined, however, to its excellence as a dessert fruit. Scarfs and other most beautiful articles of dress are imported into the Calcutta markets from Manilla and other islands of the China seas, manufactured from the fibres of the pine apple leaves.

We saw two skeins of fibre made from the leaves of the wild pine apple, and two net-bags made from the same material, which were sent from Gowhatty, in Assam, by Captain Jenkins, to the Horticultural *Society* of India. The sample was not sufficient for r fair comparative trial of its tenacity. The soty is also in possession of fibre from the leaves of Black Antigua pine, and from the Penguin pine Jamaica, which latter is occasionally made into es in the West Indies, but is not the object of any ular manufacture, the expense of labour in these onies rendering it more advantageous to import m England cordage ready made. It appears likee (*Bennett's Wanderings in New South Wales*, ., vol. II. p. 207), that at Singapore the Chinese tlers obtain fibre from the leaves of the wild pine ple, which fibres are exported to China, where they employed as a material for linen. Also, in the urnal of the Asiatic Society of Bengal, for January, 32, is a paper by Lieutenant-Colonel Watson on erra-poonjee, the sanatory station recently occupied the East India Company, in which it is stated 27) that the pine apple plant flourishes in great undance in the adjacent vallies, 4200 feet above level of the sea; and that the leaves are gathered the natives for the purpose of obtaining from m, by a very simple process, a strong fibre, which y employ as the material of the net pouches or s in common use among them.

Miss Davy, having resided in a district of India ere the pine apple grows wild, tried to prepare a ead equal to the finest flax thread manufactured in ope, and she forwarded this to the Indian Horticultural Society. The thread so prepared cannot be spun in the way of flax, wool, or cotton, from the length of the staple, but must be joined and twisted together in the same way as silk is treated, when wound off from the cocoons. The thread, in its coarsest state, might be made into a cloth, equal in strength and durability to a fabric resembling Russia duck, and would make beautiful table linen; when prepared as fine as the specimens submitted by Miss Davy, it would be equal to the finest cambric, and make a lace resembling blond.

Mr. Solly, in consequence of communications received from India, made inquiries respecting the probable value of the fibrous matter abundantly contained in the leaves of the ananas or pine apple, which, being very plentiful in several parts of India, might be imported from thence in large quantities, and at no very great cost. The result of his inquiries amongst spinners generally was, that they did not consider the fibre as capable of being substituted for flax, in the manufacture of linen and similar textures, because the trials hitherto made with it had been unsuccessful. Mr. Solly observed, that this was certainly no proof that the fibre could not be spun, but merely that the method at present employed in flax-spinning was not suitable to the pine-apple fibre; he had no doubt that it could be employed advantageously either alone or in combination with other fibrous materials, and stated that a patent had been recently taken out by Mr. Zincke for the manfacture of thread from this fibre, and from the patentee's statement, it appeared that when the fibre is bleached it becomes capable of being spun in the manner now adopted with flax, and by the same machinery, because the process of bleaching, by destroying the adhesion between the bundles of fibre, renders it much finer, and hence enables it to be extended between the rolls in the process of spinning.

The patentee considers, that from its beautiful silky lustre, combined with considerable strength, it is well adapted to form a substitute for linen. Mr. Solly thought that many other means might be found for effecting the object besides bleaching; he also suggested, as being worthy the attention of manufacturers, the possibility of the fibre being employed in the manufacture of paper, as its strength would perhaps be useful in combination with cotton and other tender materials, or in the manufacture of paper for particular purposes, when strength combined with lightness is a desideratum. (*Proceedings Royal Asiatic Soc.* 1811.)

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BIBLIOTHECA·B ·ANA

THE

GARDENER'S

MONTHLY VOLUME.

THE STRAWBERRY;

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,
Author of "The Dictionary of Modern Gardening," "Gardener's Almanack," &c.; and
ROBERT REID,
Gardener to Mrs. Clarke, Noblethorpe Hall, near Barnsley.

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THE STRAWBERRY.

HISTORY.

The strawberry, in its wild state, is found only in temperate latitudes, and in its European state of nature is an insignificant fruit. The wild Scarlet Strawberry of Virginia is superior to the natives of the same genus in "the old country;" but the really wild Alpine of the mountain districts of Italy are not much superior to the wood strawberries of England. Even the Hautbois, in its wild state, is rarely attractive either in size or flavour.

It is not known to have been a fruit with which the Greeks were acquainted; for it is a mere surmise that it is the Teiphyllon of Dioscorides; and the evidence is as defective in support of the guess that it is the Komaron of Apuleius. There is rather more justification for supposing that Dioscorides included the strawberry with other plants under the name Pentaphyllon, because the passage in Pliny (lib. xxv. c. 9), where he mentions the strawberry (Fraga), may be so construed. It is a contortion of meaning, however.

The strawberry does not appear to have been cultivated by the Romans as a garden fruit, for it is not so much as mentioned by any of their writers on the cultivation of the soil. Cato, Varro, Columella, and the rest of the Geoponic authors, do not even name this fruit; yet it was well known to the people as a wild produce among the grass and flowers about their pasture grounds; for Virgil, when warning the shepherds against the concealed adder, especially directs his monitions to those who are seeking for flowers and strawberries—" humi nascentia fraga." (*Bucolic*. iii. 92.) Ovid notices both the Alpine and the Wood Strawberry—" Montanaque fraga legebant," " Ipsa tuis manibus, silvestri nata sub umbra, mollia fraga leges," (*Met*. lib. i. and lib. xiii.); and Pliny mentions the strawberry as one of the few native fruits of Italy (lib. xxi. c. 15).

Passing to more modern times, we still find the strawberry unimproved as a garden fruit, and chiefly regarded by botanists.

When Lyte translated the " Herball" of Dodoens in 1578, there does not appear to have been any strawberries known except the Wood Strawberry, and, perhaps, the White Alpine. " Strawberries," he says, " grow in shadowy woods and deep trenches, *and banks* by highway sides. They be also much planted in gardens. The fruit is green at the first, but red when it is ripe. Sometimes also you shall find them very white when they be ripe; in taste and savour very pleasant."

Caspar Bauhin, in his "Pinax," published in 1623, enumerates the Wood Strawberry, the White Wood Strawberry, "the strawberry with fruit as large as a small plum," the Hautboy or *Haarbeer* of Gesner, and the Alpine.

In Gerard's Herball, published by him in 1597, no notice is taken of any strawberries but the Red and White Wood and the green fruited, the two last "not to be found save only in gardens;" and Johnson, in his edition of the same work, published in 1633, does not mention any others.

Servius calls them *Mora terrestris.*

Parkinson, in his *Theatrum Botanicum,* in 1640, did not add to the knowledge of the strawberry and its varieties which had been published by his predecessors; but in his *Paradisus,* which issued from the press 16 years later, he describes, besides the Wild Strawberry, the Virginian or Scarlet, and the Bohemian, which we do not clearly identify with any of the varieties we cultivate, unless it be the Hautbois. "The Bohemia strawberry," he says, "hath been with us but of late days, but is the goodliest and greatest."

Quintinnie, in his "French Gardener," translated by Evelyn in 1672, enumerates four kinds of strawberry—the White, the large Red, the Copprons, and the small red wild. The two last, he says, need not be cultivated, being obtained wild abundantly. But it is curious to find that some of our recent recommendations in the culture of this fruit are merely revivals of M. Quintinnie's practice. Among these are planting in August, removing the runners as soon as emitted, and renewing some of the beds every year, as none, he observes, should be cultivated for more than four years.

Switzer, in his "Practical Fruit Gardener," published in 1724, only mentions four kinds, the red and white Wood, the Virginian or American, and the large Hautboy or Polonian.

It is quite certain, therefore, that quite late in the last century, any highly improved variety of the garden strawberry was unknown, and we will, therefore, now proceed to detail separately such biographical notices of each kind as we have collected, and thus trace as far back as we can their respective histories.

The *Wood Strawberry*, we have seen, was known to the Romans, and being a native of our own woods, it is the earliest, also, that is mentioned by authors as an inhabitant of our gardens. We have seen that Lyte, in 1578, says it was "much planted in gardens;" and Tusser, in his "Five Hundred Points of

Good Husbandry," published five years earlier, represents the yeoman as saying, in September,

> "Wife;—into the garden, and set me a plot
> With strawberry roots, of the best to be got:
> Such growing abroad, among thorns in the wood,
> Well chosen and pricked, prove excellent good."

And Stowe, as is truly quoted by Shakspeare, records that the Bishop of Ely's garden, in Holborn, was distinguished for the excellent strawberries it produced, even as far back as the reign of Richard the 3rd (1483).

Thomas Hyll (1593) informs us, that the berries be much eaten at all men's tables in the summer, with wine and sugar, and that they will grow in gardens until the bigness of a mulberry.

The *Alpine Strawberry* was introduced into France in 1764 by M. de Fougeron, who observed it upon Mount Cenis. Three or four years previously it was cultivated in the neighbourhood of London; and M. Duchesne, writing in 1766, says that the King of England was understood to have received the first seeds from Turin: it was such a rarity that a pinch of the seed sold for a guinea, but its fecundity very speedily reduced this price. It was introduced into England by the Dutch market gardeners, who sold the plants at the rate of five livres per 100. It was from England and Holland that plants of this strawberry were first procured for the French king's garden at Trianon. (*Duchesne's Histoire des Fraisiers*, 57.) The exportation is now reversed, for Alpine strawberry seed is commonly imported into this country from Paris.

The *Cappron*, which we have seen was mentioned by Quintinnie, was the first improved garden variety, and was obtained from the seed of the Wood strawberry. It appears to have been obtained at Montreuil, in France, by a strawberry grower named Pierre Fressant, about the year 1660, and was known in 1766 as the Fressant strawberry. Duchesne thinks it is the *Fragaria hortensis* mentioned by Salmon in his *Botanologia*. (*Histoire des Fraisiers*, 113.) The variety is now unknown, but has probably been an ancestor of some of our present improved varieties.

The *Hautbois* is said by Miller to have been brought hither from America; but in this, we think, he was mistaken. It is not found native on that side of the Atlantic, but it is found wild in Germany; and Parkinson, we have seen, calls it the Polonian or Bohemian, and says it was but lately introduced. Its very name seems to be a corruption of its German designation, *Haarbeer*. It is the Capiton of the old French writers. Parkinson says (he wrote in 1629), "*it* hath been with us but of late days. Master *Quester*, the postmaster, first brought them over into our country, as I understand; but I know no man so industrious in the careful planting and bringing them to perfection in that plentiful manner, as Master Vincent Sion, on the Bank side, near the old Paris garden stairs, who, from seven roots, as he affirmed to me, in one year and a half, planted half an acre of ground with the increase from them, besides those he gave away to his friends."

The *Chili Strawberry.*—The Spaniards conveyed the strawberry with them to South America, and at the foot of the Cordillera mountains, near Quito, our present Chili variety was raised. It was seen there by M. Frezier during his "Voyage in the South Sea," and brought to France by him on his return to Marseilles in 1716. It was called by the South American Spaniards *Frutilla,* or Little Fruit, a singularly inappropriate name if the comparison was with other strawberries, for it was then the largest of the known varieties. The French, gallicizing the name, called it *Le Frutiller,* and it appears to have been first successfully and largely cultivated by them at Brest. From thence it was procured by the plant dealers of Amsterdam, and Miller imported it from Mr. Clifford's garden at Hartecamp, near that city, in 1727. It had bloomed in Miller's garden at Eltham in 1730, but had not borne fruit; and even as late as 1766, Duchesne says that *Miller* considered its cultivation abandoned *in England* on account of its sterility.

The parentage and birth-place of the *Pine Strawberry* is uncertain. It first became known to the English and French gardeners about the middle of the last century. Duchesne seems to consider it a hybrid between the Scarlet and the Chili, but Miller considered it a new species. At first, in 1759, he believed that it was a native of Louisiana, but in later editions of his Dictionary he seems to doubt between that country, Virginia and Surinam. Duchesne is quite right in thinking the latter tropical locality too hot to have been its birth-place. It reached the Trianon Gardens in 1762, and in company with other plants from Canada and Virginia. *(Histoire des Fraisiers*, 202.)

The *Scarlet*, known also as the Virginian and Canadian strawberry, is most probably a native species of North America, and brought to England before the middle of the 17th century. Bradley, in 1720, and Switzer, in 1724, mention it in their lists of garden strawberries. It was included in Tradescant's Catalogue in 1623, and more fully particularized by Parkinson in 1656. Mortimer, writing in 1707, says it was lately introduced. It is usually considered by botanists as a distinct species, but Duchesne thinks it an offspring of the Wood strawberry.

The present century, subsequently to Knight's experiments and practical directions in hybridizing, has been the birth-time of many varieties, but few of which, however, have permanent claims upon the favor of the cultivator. These few exceptions are the *Roseberry*, raised by Robert Davidson, Esq. near Aberdeen, in 1810; *Wilmot's Superb*, of great size but deficient flavour, produced in 1825; *Grove End Scarlet*, raised by W. Atkinson, Esq., at Grove End, Paddington, in 1820; *Keen's Seedling*, raised by Mr. Michael Keen, a market gardener at Isleworth, about the year 1823; *Elton*, raised by T. A. Knight, Esq., in 1828; *Downton*, raised in 1816 by the same distinguished horticulturist; and *Myatt's Pine*, *Prince Albert*, *Eliza*, and *British Queen*, all raised by Mr. Myatt, market gardener, at Eltham, within the last few years.

In Scotland, next to England, is the strawberry cultivated more largely and more generally than in any other country of Europe. We have the following particulars on the subject from Mr. J. Smith, gardener to the Earl of Hopetoun.

The cultivation of strawberries in the neighbourhood of large towns in Scotland, is found to be a very lucrative employment, and is therefore carried on to a considerable extent. By its means poor and industrious men have risen to comparative opulence, and, in some instances, the farmer has been induced to add it to the ordinary branches of agriculture. It is stated by Dr. Neill, in his treatise on the Gardens and

Orchards of Scotland,* and from sufficient data, that the quantity of land under strawberries near Edinburgh does not exceed a hundred acres.† Dr. Neill has given, in the work referred to, a brief account of the strawberry gardens in the vicinity of Edinburgh in the year 1812. At Glasgow, strawberries are estimated to occupy only one-tenth of the market gardens, which places the consumption of that town considerably behind that of Edinburgh, in which, from the market duty paid, the annual supply appears to be from 30,000 to 50,000 Scotch pints.‡ If, however, we take into account the quantities which are consumed in the gardens, a favourite resort of parties of the citizens in the strawberry season, it is probable that Dr. Neill's statement, in the work already quoted, of from 60,000 to 80,000 Scotch pints on an average, according to the season, may not be exaggerated.

The strawberry gardens in the immediate vicinity of Edinburgh are neither very numerous nor extensive, principally on account of the high rent of land; but also because most of the fields, and particularly the market gardens, have become so saturated with manure, as to cause them to be more productive of leaves than of fruit. The greater number are about Dalkeith, Laswade, Roslin, Ratho, and Corstorphine, all of which places are within eight miles of Edinburgh. There are, however, some considerable strawberry gardens beyond this circle, even as far as Haddington, a distance of 18 miles. Excepting the large sorts, they are pulled without the calyx, and are put into small baskets, each containing nominally one Scotch pint. These baskets are packed above one another in square hampers, and are conveyed to the market on a light carriage or framework, hung on springs.

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* Neill on Scottish Gardens and Orchards, in Sir John Sinclair's General Report on the Agricultural State, &c., of Scotland, vol. ii. page 90.

† The Scotch acre is to the English acre nearly in the proportion of four to five; the former containing 6084 square yards, the latter 4840.

‡ The Scotch pint contains 103 solid inches, and is nearly equal to three imperial pints.

The labour of cultivating strawberries, which is usually light, becomes incessant in the fruit season, on which account the ground employed for this purpose round Edinburgh, by one grower, is seldom more than six Scotch acres, and in general does not exceed three or four. As, however, the cultivation of gooseberries, currants, &c., is commonly combined with that of strawberries, market gardens are usually more extensive. Of these the rent varies from £5 to £15 per acre, those being cheapest which are farthest *from the city*. The average price of labour per *acre, including* carriage, &c., is less than £5; and the rate ot profit, taking a combined average sons, is from £35 to £40 per acre. Occasic much greater sum is obtained. In one inst gross amount of £120 was made from a singl planted in equal proportions with the Old Scai Roseberry varieties. Greater sums than thi been talked of, and it is said that 3400 Scotc of the Roseberry kind have been gathered f acre. The usual rate of production is mucl this, and in dry seasons very far so indeed. *Soc. Trans.* vi. 512.)

As steam power brings to us the early fi climes warmer than our own, so does it still prolong our enjoyment of the strawberry by b it to us from countries where its season of r is later. For example, a vessel, named the B brought to the port of Hull from Memel in Sept 16 cases of strawberries. This is a novel ar importation from the place named, the pro Prussia ; and whether with reference to the p growth, or the late period of the season for the of the article, is a singular and remarkable i tion. (*Gard. Chron.* 1846, 633.)

BOTANICAL CHARACTERS.

The genus *Fragaria*, the strawberry, ranks in the Icosandria Polygynia Class and Order of Linnæus, and in Rosaceæ of the Natural-System. General Character: *Calyx*—Perianth inferior, one-leaved, flat, in ten segments; the five alternate external and narrowest. *Corolla*—Petals five, roundish, equal, spreading, inserted by short claws into the calyx. *Stamens*—Filaments 20, awl-shaped, shorter than petals, inserted into calyx; anthers crescent-shaped. *Pistils*—Germens numerous, very small, collected into a head; styles simple, inserted literally into each germen; stigmas simple. *Pericarp* none; a spurious berry is formed of the common receptacle of the seed enlarged and become pulpy, soft, coloured, figure roundish ovate, abrupt at the base, deciduous. *Seeds* numerous, minute, pointed, smooth, naked, scattered over surface of receptacle.

Sir J. E. Smith paid great attention to the strawberry, and justly condemns Linnæus for carelessly concluding every species in one. Great light was thrown on this subject by Duchesne's *Histoire Naturelle des Fraisiers*, published at Paris in 1766, and by his contributions to Lamark's Botanical Dictionary. Sir James Smith thus arranges the different species *and varieties of this fruit*:—

1. *Fragaria vesca.*—Wood starawberry. Varieties: Variegated leaved, White-fruited, Double flowered, Cluster-fruited, Prickly-fruited, Blind strawberry, Monthly or Alpine, English forcing; Fressant's, larger but fainter than when wild, and the only kind in the French markets even in 1790; Runnerless, and simple-leaved. *Root* fibrous or rather woody, perennial, increasing by buds as well as runners. *Stem*, none. *Leaves* ternate on long hairy stalks, ovate, strongly serrated. *Flower-stalks* longer than leaves, erect, hairy, somewhat cymose. *Flowers* white, erect, spreading. *Fruit* drooping, ovate, fragrant, grateful and aromatic. Such is also the general habit of the genus, but this species has erect, or closely pressed upwards, *silky hairs*, on its partial or ultimate flower-stalks.

2. *F. collina.*—Green strawberry, confounded by Miller with the Pine. Varieties: German dark-leaved, Burgundy, Rough-leaved, Barren, Swedish, Provencal or Majaufe, and Champagne. *Calyx* of fruit erect, elongated, pointed. *Hairs* of leaf-stalks widely spreading; those of partial flower-stalks erect.

3. *F. virginiana.*—Scarlet Strawberry. *Calyx* of fruit spreading. *Hairs* of leaf-stalks and of all the flower-stalks erect. *Leaves* nearly smooth on upper surface.

4. *F. elatior.*—Hautbois. Variety: Royal Hautboy. *Calyx* of fruit reflexed. Hairs of the leaf-

stalks and of all the flower-stalks widely spreading, somewhat deflexed.

5. *F. grandiflora.*—Pine strawberry. Native of Louisiana. Varieties: Bath strawberry, supposed to be a cross between the Pine and Scarlet. *Calyx* of fruit erect. *Hairs* of leaf-stalks and of common flower-stalks upright, those of the partial ones rather spreading. *Leaves* smooth above, serratures ovate.

6. *F. Chiloensis.*—Chili strawberry. Native of Chili. It was more usually called the Caroline. It is curious that even in 1766 it was so scarce in France that Duchesne says he had tasted but one. Varieties: Carolina, and Canterbury or Red-fleshed. *Calyx* of fruit erect. *Hairs* of leaf-stalks and of common flower-stalks deflexed; those of partial ones horizontal. *Serratures of leaves* broader than long.

We have observed in almost every variety of strawberry that we have seen in cultivation, that some of its plants occur occasionally bearing all male blossoms, and others none but female blossoms. By far the greater number of plants in each variety have separate male and female flowers on the same plant. Those flowers which have the stamens large and the pistils small are males; when the pistil is large and prominent, and the stamens dwarfish, they are females; when the two are equally balanced they are hermaphrodite. (*Gard. Chron.* 1843, 272.)

Dr. Lindley, remarking upon these facts, observes, that some plants of the Hautbois strawberry abound in male flowers, while other plants of the same kind produce blossoms containing the female organs only, has long been ascertained in this country, and means have been taken to render them productive by planting runners of the different sexes together. We are not aware, however, that the fact of the American species frequently producing imperfect flowers has yet engaged the attention of English cultivators. To such an extent has this defect been observed in America, that one writer states his plants of Keen's Seedling to be so destitute of male flowers, that an acre of them, unless mixed with runners bearing male blossoms, would not produce a perfect fruit. The same has been observed, but to a less extent, on Wilmot's Superb and on Downton Strawberries. The same writer adds, "There is no strawberry which produces abundantly and large fruit when the male and female organs are perfect and in the same blossom. In some varieties only it amounts to a complete separation of the sexes; in others, those abounding in the female organs never produced perfect fruit. Those which abound in the male organs sometimes bear a fair crop; and where a few fruit only are perfected, they are often of a large size. In raising plants from seed, both kinds are produced, but if suffered to run together, as the male runner is more vigorous, it will make ten plants where the female forms one, and will soon root out all the bearing runners." Another singular circumstance connected with the above is, that the wild strawberry of America, which usually abounds in male flowers, has not, when planted in parallel beds with the cultivated kinds, been found efficient in fertilizing the female blossoms of the latter. Is this to be attributed to any effect produced by cultivation upon the organs of the garden varieties, or to the flowers of the wild strawberry not expanding until the others are too far gone to be influenced by them? The latter seems to be the most probable inference.

The failure of strawberries when forced early is a complaint of frequent occurrence, technically called by gardeners "running blind," and usually ascribed to want of sun and air. Is it not probable that this failure may be occasioned by the partial absence of one or other of the sexual organs, and by there being no bees to fertilize the flowers, as occurs when they expand in the open air? (*Gard. Chron.* 1843, 188.)

Passing from the blossom to the root, we may observe, that it was long the opinion of gardeners that the roots of the strawberry are annual. A more erroneous opinion, leading to erroneous practice, could not prevail, and has thus been commented upon by Dr. Lindley:—

A strawberry plant consists of a very short stem, *seated just at the surface* of the ground, covered with leaves, and throwing out from its lower end long slender woody perennial roots, which divide into a multitude of branches. The stem itself consists of a soft centre, with a woody outside, over which is the bark, which bears the leaves. The soft centre is a very large pith, and the strawberry stem is, in fact, not essentially different from the branch of a tree, one year old, with all its joints so contracted as to touch each other. The pith is a great receptacle of organizable matter; it is the source whence the leaves and fruit are fed in the spring and early summer; its starchy and gummy contents may be observed at this time of year, by any one who will cut it across and touch it with iodine; the gum will then become brown, the starch violet, and the woody matter will remain of a clear yellow. The roots extend to a considerable distance from the stem, branching in all directions in search of food, and increasing in number as the stem increases in age. Their object is to obtain unorganized food from the soil, especially water, of which we know the strawberry to be greedy. When undisturbed they live for a long time, and are at all times ready to answer the demands made upon them by the leaves and fruit.

This is the natural state of things with the strawberry. We are aware that some persons believe that *the roots* are only annual, and that the strawberry *stem* itself becomes hard and lifeless after the first season; but these are so evidently mistakes—as any one may satisfy himself by a little examination of the plant—that it seems almost unnecessary to notice them further. The only evidence we need offer in opposition to these views is to be found in those strawberry-beds which are allowed to remain for twenty years and more without replanting, and without any deterioration of the produce. The stem of the strawberry, no doubt, perishes, and so do the roots after a time, but by no means after the first season; and, so far as the roots are concerned, not till after even many seasons, if they are allowed to remain undisturbed. Mr. Knight long since exposed the error of supposing the strawberry roots to be annual productions only. "I deny," said he, "their being annual productions only; and I contend that whenever they are found wholly lifeless round the surface of the mould of pots, as they often are after unfavourable winters, the growth and produce of the plants in the succeeding year will be much diminished." Nothing can be more true, as those gardeners found to their cost, who, in the winter of 1837-8, allowed their strawberry-plants in pots to be exposed to the severe frost: the flowers of all such plants became "blind."

Such being, as we conceive, the true nature of a strawberry-*plant, it is* obvious that the roots should *be preserved. If* we ask what advantage is gained by destroying them—as necessarily happens by digging among them, for they are very long-rooted—the answer, and the only answer, is, that the soil near the strawberry-plants becomes so hard after a season's gathering, that it is unfit for their support. This may be, in some places; but if so, it would be better to loosen the ground with forks as soon as the crop is gathered, when the destruction of a few roots would be of less consequence than to break it up and destroy a large proportion of the roots in winter or late in autumn.

No possible advantage can be gained by destroying the strawberry-roots, whatever may be gained by loosening the soil in which they grow. But the disadvantages of destroying them are serious. These roots contain within them organizable matter in considerable quantity: as soon as their growth is renewed in spring, they extend by the assistance of that substance, which enables them to form their spongelets, and to advance into the earth in search of water, &c., which they immediately convey to the stem, while all the organizable matter in that stem is expended, as nature intends, in the nourishment of new leaves and fruit. But if the roots are wholly destroyed, then the organizable matter in the stem must be directed downwards for the formation of more roots; and of course the supply intended for the leaves and fruit is diminished in proportion to the quantity of roots which the stem has to form; for it must always be remembered that roots cannot be organized out of nothing. The strawberry-stem, which is intended to form leaves and fruit only, cannot have its power diverted to the formation of roots without diminishing the vigour of the leaves and fruit.

We have not to consider whether good crops are obtained in spite of this partial destruction of roots, but whether better crops would not follow its discontinuance. That nature has a wonderful power of repairing her losses is well known; that this power should be assigned to plants in a greater degree than to animals is one of the most admirable manifestations of Divine wisdom; for without it, the vegetable kingdom would disappear from the face of the earth. But it does not exactly follow that, because plants have a wonderful power of resisting the effects of mutilation, they should be called upon to exercise it needlessly. (*Gard. Chron.* 1843, 755.)

The *runners* (Flagellæ) are a distinguished feature in the physiology and economy of the strawberry. In reality they are a kind of branch shot forth from the axils of its lower leaves. After extending in the form of a bare cylindrical rod to some distance, they emit leaves and roots at their extremities, and establish fresh plants; the cylindrical rod between them and the parents, like the umbilical cord, then perishing. *Until roots* are established by the young plants these runners and the young plants themselves derive their nutriment from the parents; for, if cut off as fast as they appear, the parents are rendered in every instance more vigorous, and very often so luxuriant as to be unproductive of fruit.

CHEMICAL ANALYSIS.

The strawberry has never been analysed accurately, so as to furnish minute particulars of its constituents. Its acid is chiefly the malic, but we suspect that it likewise contains a portion of the citric. Besides these, it contains sugar, mucilage, and 9-10ths of its weight of water.

Mr. E. Solly has published the following as the results of his analyses of the *Keen's Seedling*, but his researches do not appear to have proceeded further than ascertaining the relative proportions in every 10,000 parts, of its watery, organic, and inorganic constituents.

	Water.	Organic matter.	Inorganic matter.	Inorganic matter in dry plant.
Leaves	7543	2209	249	1016
Ripe forced fruit	9320	631	49	733
Unripe fruit ..	8698	1229	73	562
Ripe fruit	9129	823	48	554

(*Hort. Soc. Trans.* iii. 63.)

VARIETIES.

In the first section of this volume, we have shewn that little more than two centuries ago not more than three kinds of strawberry were known; we have shewn how that number gradually increased, until the varieties have reached that number of which the following is a goodly list. The classification and particulars are almost entirely from the excellent Catalogue of Fruits published by the London Horticultural Society.

SCARLET STRAWBERRIES.

American Scarlet (Black American, New American Scarlet, New Roseberry, Thompson's Roseberry).—Form conical, middle-sized, quality first-rate, season beginning and middle of July, requires plenty of room, leaves tall, fruit rich and sweet, coming in late.

Autumn Scarlet.—Form ovate, middle-sized, quality middling, season beginning of July.

Bishop's Seedling.—Form round, middle-sized, quality middling, season end of June and beginning of July. The best for making jam.

Bishop's Wick.—Form conical, size large, quality first-rate, season end of June.

Black Cone.—Form conical, middle-sized, quality indifferent, season end of June.

Black Hudson's Bay (Black Pine, Hosie's Seedling).—Form conical, middle-sized, quality middling, season beginning of July.

Black Roseberry (Black round-fruited Roseberry). —Form roundish, size large, quality middling, season end of June and beginning of July; of a fine dark shining colour, a good bearer.

Carmine, Scarlet (Carmine Roseberry).—Form roundish, middle-sized, quality middling, season beginning of July, a bad bearer.

Charlotte (Princess Charlotte's, Wilmot's Early Scarlet).—Form round, middle-sized, quality first-rate, season middle or end of June, bad bearer.

Cinnamon, Scarlet.—Form roundish, middle-sized, quality middling, season end of June.

Clustered, Scarlet (Clustered Wood Pine).—Form roundish, size small, quality middling, season end of June.

Cockscomb, Scarlet.—Form compressed, size large, quality middling, season end of June.

Copper-leaved Roseberry.—Form conical, middle-sized, quality middling, season end of June.

Coul, Late Scarlet (Sir George Mackenzie's Late Scarlet).—Form ovate, size large, quality first-rate, season beginning and middle of July; an excellent late sort, a good bearer.

Diack's Seedling (New Aberdeen).—Form roundish, size large, quality indifferent or bad, season end of June and beginning of July.

Dudson-House Scarlet.—Form roundish, size large, quality middling, season end of June, abundant bearer.

Duke of Kent's Scarlet (Globe Scarlet, Prolific Scarlet, Early Prolific Scarlet, Nova Scotia Scarlet, Cluster Scarlet, Austrian Scarlet, Oatland's Scarlet, Duke of York's Scarlet).—Form roundish, size small, quality middling, season middle or end of June; early, but too small for general cultivation. This is the earliest, ripening at least a week before the Old Scarlet.

Early Globe.—Form roundish, middle-sized, quality middling, season end of June, acid.

Garnstone Scarlet.—Form roundish, size large, quality first-rate, season end of June and beginning of July.

Globular Hudson's Bay.—Form roundish, size small, quality indifferent, season end of June.

Golden Lemon Scarlet.—Form roundish, middle-sized, quality middling, season end of June.

Grange Hudson's Bay.—Form oblong, size small, quality indifferent, season end of June.

Grimstone Scarlet.—Form conical, size small, quality middling, season end of June, bad bearer. It is very sweet.

Grove End Scarlet (Atkinson's Scarlet).—Form *depressed, sperical,* size large, quality middling, season middle or end of June, very handsome, and most abundant bearer. One of the best for forcing.

Hudson's Bay (York River Scarlet, American Scarlet, Late Scarlet, Hudson's Pine of Scotland, Atkinson's Scarlet, Hopewood's Scarlet, Velvet Scarlet).—Form ovate, size large, quality middling, season end of June; Requires to remain till it assumes a dark colour, otherwise it is acid, at best not fine.

Knight's Large Scarlet (Knight's Scarlet, American Scarlet, Great American Scarlet, Hairy-leaved Scarlet, Large Scarlet, Female Parent of the Downton).—Form roundish, size large, quality middling, season end of June; a moderate bearer.

Lewisham Scarlet (Scarlet Cluster).—Form roundish ovate, size small, quality indifferent, season end of June.

Lynedock Seedling.—Form ovate, middle-sized, quality middling, season beginning of July, acid.

Melon.—Form roundish, middle-sized, quality first-rate, season end of July, a good bearer, dwarf.

Methven Scarlet (Methven Castle, Southampton Scarlet).—Form roundish, size large, quality indifferent, season end of June, large but coarse. Excellent for preserving whole.

Morrisania Scarlet (Hudson's).—Form round, size small, quality indifferent, season middle or end of June.

Nairn's Scarlet.—Form ovate, middle-sized, quality middling, season end of June.

Narrow-Leaved Scarlet (Knight's No. 14 in *Horticultural Transactions*).—Form conical, middle-sized, quality middling, season end of June.

Oblong Scarlet (Long Scarlet, Long-fruited Scarlet, Padley's Early Scarlet, Padley's Large Scarlet).—Form oblong, middle-sized, quality middling, season middle or end of June. Excellent for preserving whole.

Old Scarlet (Scarlet, Early Scarlet, Original Scarlet, Virginian, Old Bath Scarlet of some, Orange or Irish of the Dutch, Ecarlate, Ecarlate de Virginie, De Virginie).—Form roundish, middle-sized, quality first-rate, season middle or end of June, valuable for its earliness, but more especially to the confectioner, on account of its fine colour. It is usualy employed for ices, both on account of its high colour and good flavour.

Orange, Hudson's Bay (Hamilton Bishop's Pine, Orange Pine).—Form conical, middle-sized, quality middling, season end of June, acid.

Pine Roseberry.—Form conical, middle-sized, quality middling, season end of June, inferior to the Roseberry.

Pitmaston Black Scarlet (Early Pitmaston Black).—Form oblong, size small, quality middling, season *beginning of July.*

Red Finger.—Form conical, size large, quality middling, season end of June.

Roseberry (Rose, Scotch Scarlet, Aberdeen, Aberdeen Seedling, Prolific Pine, Brickley Scarlet).—Form conical, size large, quality indifferent or bad, season end of June and beginning of July; well known as a very abundant bearer, continuing late in succession. The first plant was found raised from a seed accidentally sown under a rose bush, and hence its name.

Round-fruited Scarlet (Late Round-fruited Scarlet, Knight's No. 18 in *Hort. Trans*).—Form round, middle-sized, quality middling, season end of June and beginning of July.

Scone Scarlet.—Form round, middle-sized, quality middling, season end of June. The most acid of any of the varieties.

Sir Joseph Bank's Scarlet.—Form roundish, size small, quality indifferent or bad, season middle or end of June.

Slough Scarlet (Brown's Scarlet).—Form roundish, size small, quality middling, season middle or end of June. Resembles Duke of Kent's.

Solid Scarlet (Solid-fleshed).—Form roundish, middle-sized, quality middling, season beginning of July. Hybrid between a Scarlet and a Hautbois.

Southborough (Marshall's Seedling).—Form roundish, size large, quality middling, season beginning of July, a good bearer, but not fine.

Vernon's Scarlet (White's Scarlet).—Form round, middle-sized, quality middling, season end of June. Excellent for preserving whole.

Wilmot's Late Scarlet (Wilmot's Scarlet, Wilmot's New Scarlet, Wilmot's Seedling, Wilmot's Imperial, Large Virginian, Late Virginian).—Form obtusely conical, size large, quality middling, season end of June.

BLACK STRAWBERRIES.

Downton (Knight's Seedling, Knight's Strawberry, Knight's No. 7 in *Hort. Trans.*).—Form ovate, size large, quality first-rate, season beginning or the middle of July; the best of this class of strawberries, being a great bearer, preserving well, making rich sweetmeats, and mixing particularly well with cream.

Elton (Elton Seedling).—Form ovate, size large, quality first-rate, season middle or end of July, a great bearer, valuable as a very late sort.

Gibb's Black Seedling.—Form conical, size small, quality middling, season beginning of July.

Knight's Scarlet-fleshed (Knight's No. 16 in *Hort. Trans.*).—Form conical, middle-sized, quality middling, season end of June, more red inside than out.

Myatt's Pine.—Form ovate, middle-sized, quality first-rate, season end of June, very rich, but difficult of cultivation.

Pitmaston Black (Late Pitmaston Black).—Form ovate, size large, quality first-rate, season beginning of July; so tender that it generally dies off in winter, consequently it is unfit for cultivation.

Old Black (Black, Black Canterbury, Black Pine, Turkey Pine, Black Beacon, Mulberry).—Form conical, middle-sized, quality middling, season beginning of July.

Sweet Cone (Knight's No. 3 in *Hort. Trans.*).—Form ovate, size large, quality first-rate, season end of June, of excellent flavour, but tender and not prolific.

PINE STRAWBERRIES.

Bath Scarlet (Bath, New Bath Scarlet, Liverpool, Golden Drop, Devonshire, North's Seedling, Milne's Seedling, Imperial Scarlet, Austin's, Carolina Pine, Surinam of some, Scarlet-fleshed Carolina, Chili).—Form ovate, middle-sized, quality middling, season beginning of July.

Black Prince (Wilmot's Black Imperial)—Form roundish, middle-sized, quality middling, season end of June; shy bearer.

Bostock (Rostock, Rostock Seedling, Rostock Pine, Rostock Scarlet, Wellington, Cone, Byram, Caledonian, Vernon's, Montague's, Prolific Bath, New

Bath, Whitley's Pine, Beattie's Seedling, English Globe, Red Chili, Devonshire, Devonshire Chili, Red Bath, New Scarlet).—Form roundish, size large, quality middling, season end of June; a very great bearer, but the fruit is coarse and hollow. This strawberry was raised at Bostock, in Cheshire.

British Queen, Myatt's.—Form roundish, size large, quality first-rate, season end of June, very large and good, bears abundantly.

Bullock's Blood.—Form roundish, size small, quality indifferent, season beginning of July.

Chinese (North's Seedling, Red Chili, North's Large Scarlet, Bourbon of the Americans, Chapelizod, Carolina of some, Large Chili, Pine Apple).—Form roundish, size large, quality indifferent, season end of June and beginning of July. This and the Surinam were formerly much cultivated on account of their abundant bearing, but are now giving way to the superiority of Keen's Seedling.

Dutch.—Form roundish, size large, quality indifferent, season end of June and beginning of July. The synonyms attached to the Round White Carolina are also applicable to this, with the exception of the last.

Eliza, Myatt's.—Form ovate, middle-sized, quality middling, season middle of June.

Glazed Pine (Knott's Pine, Scarlet Pine Apple, *Chinese of some, Carolina* ditto, Red Chili ditto).—

Form conical, size large, quality middling, season beginning of July.

Keen's Imperial (Imperial, Black Imperial, Large Imperial Black, Imperial Pine, Black Isleworth, Keen's Black, Keen's Large-fruited, Isleworth Pine, Large Black, Keen's Black Pine, Nectarine).—Form roundish, size large, quality middling, season end of June; tender and a shy bearer. Keen's Seedling was raised from this variety.

Keen's Seedling (Keen's New Seedling, Keen's New Pine, Keen's Black Pine, Murphy's Child).—Form roundish, size large, quality first-rate, season middle or end of June, excellent and productive; one of the best for cultivation and for forcing.

Knevett's New Pine.—Form roundish, size large, quality middling, season end of June; a shy bearer, will not grow in many soils.

Large Black Seedling.—Form roundish, size large, quality middling, season beginning of July.

Mulberry (Mahone, King, Cherokee, Surinam of Scotland).—Form ovate, middle-sized, quality indifferent, season beginning of July.

Old Pine or *Carolina* (Pine, Carolina, Scarlet Pine, Old Scarlet Pine, Old Carolina, Common Carolina, Carolina Pine, Large Carolina, Blood Pine, Pyne Hill, Grandiflora, Black Pine, Borsdorf, Surinam or Scarlet-fleshed, Superior, Shaw's Scarlet).—Form ovate, size large, quality first-rate, season end of

June, and beginning of July. A solid, juicy, and peculiarly rich fruit, exceeded by none: Keen's Seedling is earlier, more productive, and profitable for the market; but its cultivation on these accounts ought not to supersede that of the Old Pine, the superior quality of which entitles it to be strongly recommended.

Red Cone.—Form ovate, middle-sized, quality middling, season end of June.

Round White Carolina (Carolina, White Carolina, White Pine, Large Blush Pine, White Bath, Red and White Bath, Large White, Chili, White Chili, Large White Chili, Large Pale Chili, Large Flesh-coloured Chili, Cone, Globe, Conical White Carolina).—Form roundish or irregular ovate, season end of June and beginning of July; fruit large, and being white with sometimes a blush of red, it makes a pleasing variety.

Surinam (Red Pine, Red Pine Apple, Sutton's Large, Oldaker's New Pine, Red Chili, Chinese, Devonshire Scarlet, North's Seedling, Ananas or Apricot of the Dutch, De Carolina).—Form roundish ovate, size large, quality indifferent, season beginning of July.

Swainstone's Seedling.—Form ovate, season end of June; bears abundantly, and sometimes a second crop *in autumn.*

Taylor's New Emperor.—Form roundish, middle-sized, quality middling, season end of June.

Turner's Pine.—Form ovate, season end of July; cultivated only for its lateness.

Variegated Pine (Striped-leaved Scarlet).—Leaves variegated with white, tender and worthless.

Westbere.—Form ovate, middle-sized, quality middling, season end of June and beginning of July.

CHILI STRAWBERRIES.

Black Chili.—Form irregular, size large, quality indifferent, season beginning the middle of July; coarse.

Large Blush Chili.—Form ovate, size large, quality indifferent, season the middle of July; scarcely distinguishable from the True Chili.

Pine Chili.—Form ovate, size large, quality indifferent, season the middle of July.

Red Chili.—Form ovate, middle-sized, quality indifferent, season middle and end of July.

Scarlet Chili.—Form ovate, size large, quality middling, season middle and end of July.

True Chili (Patagonian, Greenwell's, Greenwell's French, Greenwell's New Giant, Du Chili, Frutiller).—Form ovate, size large, quality indifferent, season the middle of July. It may be said of the Chilis generally, that they are tender, bad bearers, and of indifferent quality.

Wilmot's Superb.—Form roundish, size large, quality middling, season beginning of July, fruit hollow and woolly.

Yellow Chili.—Form irregular, size large, quality middling, season beginning of July.

HAUTBOIS STRAWBERRIES.

Black Hautbois (New Hautbois).—Form ovate, size large, quality first-rate, season end of June and beginning of July.

Brown Hautbois.—Form ovate, size large, quality middling, season end of June and beginning of July.

Common Hautbois (Hautbois, Old Hautbois, Original Hautbois, Diæcious Hautbois, Hautbois or Musky).—Form roundish or ovate, middle-sized, quality middling, season end of June and beginning of July.

Globe (Caperon Ordinaire, Antwerp or Musk, Danish).—Form roundish, middle-sized, quality middling, season end of June and beginning of July.

Large Flat (White, Bath, Salter's, Formosa, Lowder's, Weymouth).—Form roundish, season end of June and beginning of July; abundant bearer, retains its character better than the other sorts.

Long-fruited Muscatelle.—Form oblong, size small, quality middling, season beginning in July.

Prolific or Conical (Double Bearing, Hermaphrodite, Hudson's Bay of some, Musk, Regent's, Dwarf, Sacombe, Sir Joseph Bank's, Spring Grove, Caperon Royal, Caperon Hermaphrodite).—Form conical, size large, quality first-rate, season end of June and beginning of July. Flowers the largest of the class, receptacle broad, stamens long, persisting round the base of the fruit even to the period of its maturity; one of the best.

Round-fruited Muscatelle.—Form roundish, size small, quality indifferent, season beginning of July; a variety of the Globe, high flavoured.

Russian.—Form ovate, size small, quality indifferent, season beginning of July.

Swedish.—Form roundish, size small, quality middling, season beginning of July; habit dwarf, unworthy of cultivation.

GREEN STRAWBERRIES.

De Bargemont (Majaufe).—Form roundish ovate, middle-sized, quality middling, season beginning the middle of July.

Breslinge d'Angleterre (De Pensylvanie).—Form roundish ovate, size small, quality indifferent, season beginning of July.

Caucasian.—Form roundish, middle-sized, quality middling, season end of July.

Green (Green Pine, Pine Apple, Green Alpine, Green Wood, Powdered Pine, Vert d'Angleterre, Fraisier Vert).—Form roundish or depressed globular, size large, quality middling, season middle of July, fruit solid, flesh greenish, very juicy, of a peculiar and somewhat pine-apple flavour.

Vineuse de Champagne (Fraisier de Champagne). —Form conical, size small, quality middling, season beginning of July.

Williams's Green Pine.—Form roundish, middle-sized, quality middling, season end of June.

ALPINE OR WOOD STRAWBERRIES, WITH RUNNERS.

American Alpine.—Form conical, size large, quality first-rate, like the Red Alpine.

Besancon.

Double Blossomed (A Fleurs Doubles, A Fleurs Semidoubles).—Worthless as a fruiting variety.

De Montreuil a Fruit Blanc.—Form ovate, size large, quality first-rate, season beginning of July; fugitive varieties of the Alpine or Wood.

De Montreuil a Fruit Rouge (De Montreuil a Marteau, Fressant, Dent de Cheval, De Ville de Bois).—Form ovate, size large, quality first-rate, season beginning of July.

One Leaved (One Leaved Alpine, De Versailles, A Feuilles Simples).—Form roundish, size small, quality middling, season beginning of July.

Red Alpine (Des Alpes à Fruit Rouge, Des Alpes de tous les Mois a Fruit Rouge, Des Alpes de deux Saisons a Fruit Rouge, Des Alpes de quatre Saisons a

Fruit Rouge, Alpine Rouge, Scarlet Alpine, Prolific Alpine).—Form conical, size large, quality first-rate, season June and November.

Red Wood (Commun Rouge, Commun a Fruit Rouge, Des Bois a Fruit Rouge).—Form roundish, size large, quality first-rate, season end of June and July.

White Alpine (Des Alpes a Fruit Blanc, Des Alpes de tous les Mois a Fruit Blanc, Des Alpes de deux Saisons a Fruit Blanc, Des Alpes de quatre Saisons a Fruit Blanc, Alpine Blanc).—Form conical, size large, quality first-rate, season June and November.

White Wood (Commun Blanc, Commun a Fruit Blanc, Des Bois a Fruit Blanc).—Form roundish, size large, quality first-rate, season end of June and July.

ALPINES, WITHOUT RUNNERS.

Bush Alpine, Red (Buisson, Buisson a Fruit Rouge, Commun sans Filets, Sans Coulans Ordinaire, Sans Filets Ordinaire, Buissons des Alpes Rouge, Des Alpes sans Coulans a Fruit Rouge, Des Alpes sans Filets a Fruit Rouge, De Gaillon a Fruit Rouge).—Form roundish ovate, middle-sized, quality middling, season beginning of July.

Bush Alpine, White (Buissons des Alpes Blanc, Buissons a Fruit Blanc).—Form roundish ovate, middle-sized, quality middling, season beginning of July.

SELECTIONS FROM THE FOREGOING.

June Production.—Duke of Kent's Scarlet, Old Scarlet, Grove-end Scarlet, Keen's Seedling, Myatt's Pine, British Queen and Roseberry.

July Production.—Pitmaston, Downton, Elton, Turner's Pine, Prolific Hautbois.

From June to end of November. Red and White Alpine.

For Forcing.—Old Scarlet, Grove-end Scarlet, Keen's Seedling and Roseberry.

For Preserving Whole.—Oblong Scarlet, Methven Scarlet, Vernon's Scarlet and Downton.

For Jam, Ices, and Creams.—Old Scarlet, Bishop's Seedling and Downton.

MODES OF PROPAGATION.

THERE are two modes of propagating the strawberry —by Seed and by Runners.

By Seed.—The only kinds that can be propagated by seed, with a certainty that the seedlings will resemble the parent, are the Alpine, the Wood, and the Scarlet. Seeds from all these are readily obtained from fruit ripening in this country, but the best seed *of the true Alpine,* that is, secured from hybridization, is obtained from the Parisian seedsmen, for in France it is most extensively cultivated.

Saving the Seed.—For the following modes of obtaining seed we are indebted to M. Morel de Vinde. His directions were intended especially for the Alpine, but they are equally applicable for obtaining the seed of any other kind.

Ripe seed may be procured in two ways:—First, during the first year the plants have produced fruit, collect a sufficient quantity of well-shaped and well-ripened berries, and the best time to do this is towards the end of the full crop, that we may be sure we have got the proper sort, and that we have not gathered the seeds either from degenerated plants, or from other varieties which may have intruded into the bed. Put these berries upon a plate, and set them in a dry place out of the reach of mice. They will then decompose and dry up. No danger is to be apprehended from the berries becoming putrid or mouldy; for the decomposition of the pulp tends only to perfect the seeds. The strawberries thus dried are to be kept till the following spring, when, by rubbing them between the fingers, the seed may be easily separated from the remains of the pulp, which may be thrown away as useless, and then the seeds will remain unmixed and almost perfectly clean. Or, secondly, take the strawberries, selected as in the former case, and squeeze them in a hair searce or sieve of a pretty close texture; pour water upon them, shaking and separating them at the same time with the hand; press them against the searce, and in a short time the diluted pulp will pass through and leave the seed. These may be either sown immediately, or kept in a dry place until the spring. (*Caledonian Hort. Mem.* iii. 417.)

Sowing should take place immediately the seed is obtained from the berry, and the seedlings will then bear fruit the next year. Select a light rich soil with an easternly aspect, so as to be shaded from the mid-day sun; sow very thinly, in drills nine inches apart, and bury the seed not more than a quarter of a inch below the surface. Give gentle waterings daily during dry weather, and keep the seedlings well cleared from weeds. In August thin the plants to six inches apart, and those thus removed may be pricked out at similar distances in a like sheltered soil. In the early spring give them a slight top-dressing of leaf mould. Instead of sowing in the open border, some gardeners prefer employing pots or seed pans, which we consider necessary only where small quantities of hybridrized seed are to be sown; in that case the pans should be placed in a warm aspect, and on ground where the worms cannot penetrate; if placed in a frame, it will be an advantage, or a hand glass, when only a single pan is sown, placed over it, to protect it from violent rains, as well as to forward the germination. A thin mixture of common whitening and water, and a thin coat of this laid on the inside of the hand-glass or frame-light, with a soft brush, will be an effectual shade from the mid-day sun, and at the same time will admit sufficient light for the seeds to germinate and grow till they are strong enough to bear exposure to the sun and air.

Sowing Alpines.—The seed of the Alpine strawberries is sown in pans, and placed in a hotbed about February, or not later than the first week in March. When the plants are hardied off, they are planted out in good time in May, and will bear a plentiful crop in August and September following, and continue to bear until stopped by the frost. Seed should always be saved from the finest fruit, to get them large; and plentiful waterings (with now and then manure-water) will improve the size of the fruit. (*Gard. Chron.* 1841, 116.)

Cross-breeding.—No fruit has been more improved by this system of impregnation than has the strawberry. We have no doubt that all the varieties at present so distinguished for large size as well as luscious flavour, are descendants through various cross alliances from the Wood, Alpine, Scarlet, and Hautbois.

The results of many experiments upon the different kinds of strawberries which are cultivated in our gardens, led Mr. Knight, some years ago, to conclude that we possess three different species of that genus: the Wood or Alpine, the Scarlet in many states of variation, and the Hautbois. He failed to obtain mule plants between the Alpine and the Scarlet, and Hautbois, which he inferred to be of distinct species; because they did not, under favourable circumstances, breed at all with each other. But subsequently, Mr. Williams, of Pitmaston, obtained mule plants from the seeds both of the Scarlet and Hautbois, and the pollen of the Alpine strawberry. One of these, which sprang from the seed of the Hautbois, presents in its foliage and habit the character of its female plant, without any perceptible variation. It blossoms very freely, and its blossoms set well; but the growth of the fruit subsequently remains very nearly stationary during the whole period in which the Hautbois strawberry grows and ripens; after which it swells and acquires maturity. It is then rich and high-flavoured, but of less size than the Hautbois, and without seeds. Mr. Williams, however, once obtained a single seed, which afforded a mule plant in every respect similar to its parent. (*Knight's Papers*, 276.)

Since Mr. Knight instituted experiments, resulting in obtaining the Downton and other excellent varieties, Mr. Keene, Mr. Wilmot, and Mr. Myatt, have successfully followed in his steps, and the field is still open and unexhausted for the judicious experimenter. *It is scarcely possible* to offer suggestions for his guidance. The Chili offers size, which is always desirable in the female parent; the Scarlet will impart grateful acidity if its pollen be employed; whilst the Pines and Hautbois will give increased aroma. The anthers must be removed from such flowers of the female parent as are monœcious, and the pollen from the desired male be added by the aid of a camel-hair pencil.

By Runners.—More information on this mode of propagation will be found incorporated with the directions for out-door and forcing cultivation than we shall give in this section. Every means are desirable to be adopted for inducing the first joint of the runner to emit roots. This should be pegged down upon the soil of the bed, or in a pot, so soon as its leaves are moderately developed; and the emission of roots is promoted by stopping the runner, that is by pinching off its tip just beyond the first joint. If it is wished to increase the stock of any scarce sort, instead of pinching off the tip of the runner beyond the first joint, let it continue growing, when it will form three or four runners in succession, which should be carefully pegged down as fast as they are formed. By following up this method carefully, a good stock may be raised from a single plant in the course of the summer.

The best of all plans to obtain a large crop of superior fruit from runners of the previous season, is to lay them on three-inch pots filled with soil, placing a stone on the runner to keep it in its place, and pinching the top off. In ten days or a fortnight the runner will be sufficiently rooted to turn out of the pot with the ball whole, which may then be planted out where it is to remain. Plants treated in this way will produce better crops the following spring than any other method we have ever seen practised.

It is a good plan to plant out the rooted runners in beds to remain as soon as they are well rooted in their beds; only planting them twice as thick as they are to remain. Let them fruit the next year, and as soon as their fruit is off, dig up every other plant. If the runners are not put in early, and kept clean, and prevented from making new runners, and the barbarous plan of cutting the leaves in the autumn is avoided, a fair crop is obtained the first year, and one season saved. (*Gard. Chron.* 1841, 342.)

Mr. Sherwood says, that the best way of obtaining strong plants early, is to dig the ground round the outsides of the bearing beds, and peg the young plants down upon it; stop the runner beyond each, and by the middle of August they will be well rooted; let them be taken up with good balls of earth, and planted in rows eighteen inches apart, and a foot in the row; water them well, make the ground smooth, and let no one set a foot upon it, except to chop up *the weeds and pinch* off runners, for the next six months. The less the soil is trampled upon, the more equal its porosity; consequently, the greatest encouragement is given for the roots to ramify, and both air and water the more readily reach them. About March the ground between the rows should be stirred with a fork, and left light till the plants come into bloom, then covered with litter or short grass, to prevent the moisture from evaporating, and the fruit (of which a moderate crop of fine berries might be expected) from getting dirty. After the fruit is all gathered, every other row of plants should be destroyed, which would leave the remaining ones one yard apart. They should not, however, be kept to single plants, but the young ones that root within six inches of the parent plant, both right and left, should be permitted to remain. Thus the rows or strips would be one foot in width, having a space of two feet clear ground between them; this should be dug up, and the rows to be destroyed turned in.. If a little dung or guano is forked in the following spring, and the mulching repeated, an abundant crop might be expected. After this they might stand one year longer and no more, treating them as before. By adopting the above plan, one-third of the crop would have to be renewed every year They should not be kept to the same ground continually, but alternate with other crops. It is not uncommon to hear persons complain of strawberries "going blind" in a dry season, although regularly watered during the time they were in bloom; and if such persons believed that the water either soaked into the leaves, or if into the roots, that they were all within an inch of the surface, there would certainly be something unaccountable in the result. But if they happened to know that, for water to be of any real benefit to the plant, it must find its way to the extreme points of the roots—that these were, or ought to be, a foot or more down in the ground—and that instead of the water reaching them, and thereby assisting the plant to form the fruit, it was all evaporated, and went up into the air to form clouds—there would then surely be nothing mysterious about the loss of the crop. If water is given (and in dry weather it ought to be), let it be applied in large quantities; if the soil between the rows was kept porous, it would pass readily to the spongeoles, and such watering would not prove to be labour in vain. (*Gard. Journ.* 1845, 344.)

Root-division.—The Alpine and Green strawberries are sometimes increased by this mode; but the plants are neither so productive nor so long-lived as those raised from seed.

SOIL, SITUATION, AND MANURES.

There is no doubt that any rich, deep loam will produce good strawberries, but it is well to know that some varieties thrive better upon particular soils than do others. Thus the Alpine and Virginian will thrive best upon a clayey soil. Myatt's Pine, British Queen, and Downton, will succeed better than other varieties on light soils. Myatt's Pine will also grow profusely on light, rich, sandy, alluvial soils near the sea. In such situations other strawberries are apt to throw out too many runners; but for such Myatt's Pine is well adapted.

If a soil be very tenacious it may be advantageously rendered more porous by mixing with it old bricklayers' rubbish and bog earth. The latter, indeed, is one of the best applications that can be given to strawberry beds, mixed with rotten leaves, or well-decayed stable manure.

Whatever be the soil, it should be thoroughly drained; and Mr. Sherwood is quite right in saying the strawberry delights in a strong loamy soil, though growing tolerably well in almost any other; but, of whatever quality, the ground ought to be drained, and, if possible, the drains should be two feet below the surface: at that depth drains never carry away any water that is essential to the ground and production of the plants, even in ground that is naturally dry; and if properly made, they promote a circulation of air around the roots, than which nothing is more conducive to a luxuriant vegetation. The next thing requisite is a good trenching. Let a good coat of manure be buried beneath fifteen inches of soil, well broken in the turning up, and the preparation for the plants is complete. (*Gard. Journ.* 1845, 344.)

For Potted Strawberries, the soil should be lighter and richer than for those in the open ground. Good drainage for them is also quite as important.

Mr. Reid finds the best soil for potted strawberries to be three parts of strong turfy loam, which has been stacked up in a heap about six months, chopped small, but not sifted. Three parts of this to one part of very rotten stable manure, or, which is better, cow-dung about 12 or 18 months old, rotten enough to go readily through a coarse sieve; and a small quantity of lime rubbish or coarse sand added; the whole turned over two or three times till well mixed together; and in draining, use not less than 1½ inch of the siftings from the dung and the most fibrous lumps of the loam mixed together, with a sufficiency of potsherds over the hole of the pot.

Situation.—Though the Wood strawberry delights in shaded places, yet the Alpine equally requires a *free and breezy locality*; and the Virginian, another of the progenitors of our garden varieties, is found in greatest perfection in the open prairie. Hence, though they will succeed when partially shaded by trees, yet they are best flavoured when grown in an open compartment, with no other shade than that from their own leaves. If Alpines are planted on south-west and east borders, they will give a succession of fruit from June till December. (*Johnson's Dict. of Modern Gardening.*)

We coincide with Mr. Haynes in thinking that every facility should be given to expose our chief garden varieties fully to the sun, provided moisture is preserved to their roots. He says—

The situation ought to be as open an exposure as can be obtained; the bed or border pointing duly east and west, and extended as far as may be convenient, in order to receive, on the south side, a temporary shade or skreen, to afford protection to the blossom and fruit, when necessary, from the violent heat of the mid-day sun, and that they may receive the benefit of its early and late rays, after such skreen is applied. (*Haynes on Strawberry,* 4.)

Mr. J. Middleton, gardener at Tillychewan, N.B., is also quite right in his observations upon the effects of different sites. He says—

As to situation, prefer that which is open and airy, except for the Alpine kinds, which a northern shaded border has not only the effect of preserving till a later period of the season, but it ensures a heavier crop. In shady situations, however, their flavour is rather inferior, and they produce very good crops in open exposures. (*Caledonian Hort. Mem.* iv. 410.)

Where there is sufficient ground at command, it is an excellent plan, in order to prolong as much as possible the succession of ripe strawberries, to plant some of each sort in all aspects except north; by so doing, it will be found to make at least a fortnight or three weeks difference in the duration of the fruit season; for, notwithstanding Mr. Middleton's recommendation, we never knew Alpines do well in a north aspect. An excellent plan to skreen the beds from the scorching sun, is so to contrive the beds when planted, that a row of peas can be sown on the south side, the time of sowing to be calculated so that the peas will reach the top of the sticks when the fruit is nearly full size. Where a variety of aspects cannot be obtained, leave wide alleys between the beds, and sow a row of peas between, which will answer the same purpose, and benefit both crops. Steep banks formed into terraces, with rough dry stone walls, and filled up with good soil, make excellent situations for strawberries, especially where a good supply of water can be had. There are many good situations for this purpose on railway cuttings, and near the stations, which might be turned to good account, as a plentiful supply of soil can easily be had for such places.

Manures.—The best top-dressing for strawberry beds is a little leaf-mould, pointed in with a fork, early in March. A good addition also is nitrate of soda, 3 ounces to each square yard, sprinkled over the surface at the same season. Bone-dust and charred turf, pointed in with a fork, in October, have also been found highly beneficial. (*Johnson's Modern Gardener's Dict.*)

Compost.—Mr. Haynes gives the following as—

The proportions of the articles proper to form a compost, for applying to the beds for dressing. One half of fresh or maiden earth from a rich pasture ground of cool, soft, and loamy texture, taken one whole spit deep with the turf; one-fourth of soft and black earth, or of any other substitute that can most readily be obtained; with one-fourth of rotten neat's, cow's, or swine's dung; or in default of this, the most rotten hotbed manure, well incorporated, which will be most readily effected by laying the whole together, and frequently turning it over during six, nine, or twelve months. (*Haynes on Strawberry,* 17.)

Various other kinds of manure have been very successfully employed for promoting the productive vigour of the strawberry.

Super-phosphate of Lime and Sulphate of Ammonia have been tried and recommended by Mr. J Elliot, gardener at Norton Conyers, near Ripon. He says hat the loam for potting and top-dressing, containing ae-third decayed vegetable matter (humus), is mixed ith eight per cent. of the super-phosphate of lime, bulk. For watering, to the ammonia is added one-alf its weight of sulphuric acid, and the whole is iluted in 2000 parts rain water, irrigating twice a eek during summer and autumn, and whenever the oil requires moisture in spring, preserving a humid tmosphere. The kind of strawberry is Keen's eedling. (*Gard. Chron.* 1845, 433.)

Guano requires to be used very sparingly. It is uite evident that the luxuriant growth given by uano to that shy-bearing strawberry Myatt's Pine, highly advantageous to its fertility. Most persons gree in acknowledging Myatt's Pine strawberry to e the finest flavoured, and most difficult to cultivate uccessfully, of any in our gardens. We believe, owever, that complaint against its fertility need no nger exist. If runners be planted as they can be btained, certainly not later than July, and the beds e supplied with guano-water, 4 oz. to the gallon, nce a week, for four weeks, commencing as soon as he blossom-buds are visible in the hearts of the lants, we believe that they will not fail to bear abun-lantly; and, by maturing the latest flowers, will con-inue longer in bearing than many other sorts. Pro-ably it would be advantageous to apply a little guano *the plants in September*; but if greatly stimulated at this season, the plants may possibly be driven into flower to the prejudice of the spring blossom. (*Gard. Chron.* 1843, 661.)

Bone-dust, from the phosphate of lime which it contains, proves to be an excellent manure for the strawberry. Mixed with sulphuric acid, we have found it highly beneficial.

Three beds, each containing about 150 plants of Myatt's Pine strawberry, were manured in the spring, the first with nitrate of soda, the second with guano, and the third with bone-dust. No difference in produce appeared the same year; but next year, the one to which the bone-dust was applied was much the best. (*Ibid.* 1844, 505.)

Soot is good as a top-dressing; and one writer says that no stimulant is equal to soot-water for the strawberry. In preparing the compost tor the last shifting, add to one barrowful of good rough loam thaee shovelsful of leaf-mould and one of soot. (*Gard. Journ.*)

Nitrate of Soda has been found to succeed, after being tested rather extensively.

The proportion in which nitrate of soda has been successfully applied to strawberries is 3 oz. to the square yard, sprinkled regularly over the surface of the bed just as the plants are beginning to grow. Although it may injure the foremost leaves, the succeeding ones will soon push forth with redoubled vigour. (*Gard. Chron.* 1843, 121.)

Saline Compost.—The following compound is said to have promoted the productiveness and luxuriance of this fruit:—1 lb. each of Epsom salt, Glauber's salt, pearlash, and carbonate of soda, and ¼ lb. of muriate of ammonia, to 60 gallons of water. Apply it as soon as the plants show signs of growth in the spring, watering them pretty freely without a rose three times, at intervals of about a week, so as to finish before they come into flower. And if the season be dry it is absolutely necessary to supply them liberally with common water afterwards during their whole time of growth, or their increased activity will very quickly kill them. (*Ibid.* 1845, 562.)

In concluding this section, it may be as well to observe, that where manures of any kind are scarce, or not to be had in sufficient quantities, ground may be brought into tolerably good order by collecting green and decaying vegetables, leaves, &c., and digging them in at once, and then sowing light crops, such as peas, celery, and even potatoes, if planted pretty wide apart in the rows; all of which crops, if kept clean, and otherwise in good order, will bring the ground, with the assistance of top-dressings afterwards, into a tolerably good heart for growing strawberries.

OPEN-GROUND CULTURE.

Beds.—Having selected the soil and site for our strawberry plantation, the next consideration is the arrangement of the beds, and these, whatever be the mode of cultivation adopted, should be made so narrow as to allow of every necessary cultivation, gathering of fruit, &c., without it being requisite to trample upon them. The reason for this is, that the beds will have to remain in production for three or more years, and in that time the soil becomes consolidated even by its own gravity, and yet any loosening of the soil by the spade is not permissable.

Even if the soil be fertile, it is well at the time of planting to give it a preparatory dressing, and the following mode is as good as any.

On the piece of ground intended for planting spread a layer of long stable-dung, a foot thick. Trench the ground three feet deep, putting the manure at the bottom of the trench. Long dung is then to be spread on the surface of the trenched ground, to the depth of six inches, and afterwards dug in.

Mr. Reid's mode is to spread on the piece of ground intended for planting, a layer of half-rotten stable manure, from six to twelve inches in thickness, as the fertility or poverty of the soil may require. *Trench it* carefully in, from two to three feet deep, thoroughly mixing the manure with the soil by breaking each as small as possible.

A bed thus made will last three years without requiring any thing further, not even so much as a top-dressing, but the beds to be kept free from weeds. Strawberries planted upon ground thus prepared do not require to be watered even in the hottest weather, because of the depth to which the roots will penetrate. (*Gard. Chron.* 1842, 694.)

The beds should not be more than four feet wide, and should range in length east and west, not only because by this mode the roots of the plants can be better sheltered by their own foliage from the direct rays of the sun, but because they can be more easily protected by artificial shades, which are most advantageously used at certain periods of growth, as will be explained in a future page.

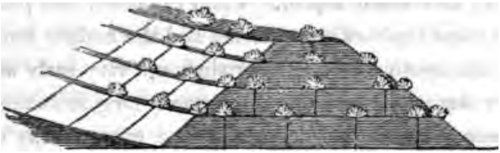
Ridges.—The most usual practice, and we think the best, is to form the beds on a level surface. But, among others, John Williams, Esq., of Pitmaston, near Worcester, cultivates strawberries on small ridges of earth running north and south, about nine inches above the level of the ground, planting the strawberries on the top, and laying plain tiles on each side of the ridge. He finds the produce earlier, more abundant, and better flavoured, than on plants grown on the flat ground. The flat tiles retain the moisture, *promote the ripening* of the fruit, and keep it from dirt after heavy showers of rain. (*Hort. Soc. Trans.* vi. 8.)

The only advantage of ridge-growing seems to us to be that it admits more readily the application of water to the roots of the plants; though this seems counterbalanced by the liability of such small elevations to dry and crack though protected by the tiles.

Walls especially constructed for the growth of strawberries have been occasionally formed, and of these one constructed by Mr. Byers, of Swansea, is recommended by Dr. Lindley, he having witnessed its success in various places where it has been tried. It may be termed a strawberry wall, and is formed in the following manner:—A steep bank of suitable soil is first prepared, and a layer of stones or bricks about six inches high is placed evenly along the bottom of it; this is covered a couple of inches deep with good soil, and the runners planted in it six or eight inches apart. Another layer of stones is then placed over the first one, and made to slope inwards, which is again covered and planted with runners as before. The same process is repeated until the wall or bank is raised to a sufficient height. Strawberries grown in this manner are always earlier and cleaner than from a border; and another advantage is, that more plants may be grown in a small space of ground than by any other method in general use. (*Gard. Chron. 1841,* 485.)

The following is a fuller description of the structure and its advantages, from Mr. Byers' own pen. He established one first at his residence, Mount Pleasant, near Swansea.

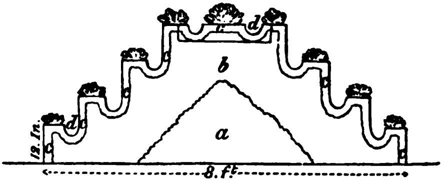
Suppose a bed 20 feet long, by 3 feet 6 inches wide, place round this bed, stones or bricks about 6 inches high, and as nearly level as you can with convenience, fill the within space, and about an inch above it, with compost in which there is a fourth gravel or small stones. Around the whole bed place your plants 6 inches apart (it will require about 94 plants for the first tier). Again, place another course of stones of the same size, beveling inwards on all sides at an angle of 45 deg.; this fill with the same compost, and plant as for the first row of plants. Proceed thus,



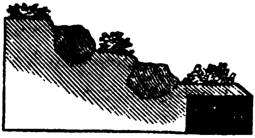
stratum super stratum, until you have raised your bed about 3 feet high, which will give you six rows of plants around your bed and one row at the top. The advantages of this are as follows:—A much larger quantity of plants is grown on a given quantity of *ground. You obtain* a succession crop, by placing your bed north and south. You can water them with facility from the top, in which a trench should be left for that purpose. The fruit can be gathered with more ease and convenience; and the last and most important advantage is, that your fruit is free from sand and earth, should heavy rains occur during the period of its ripening. To renew the bed, in August remove all the stones but the lower row, and gently fork up the earth, adding a little rotten dung, and replant and replace as above. (*Gard. Mag.* v. 437.)

Banks.—These are cheaper structures, yet seem to be capable of securing all the advantages that are offered by walls for strawberry culture. The most effectual bank that has been formed for the purpose, seems to be the following:—

The bank should run east and west, presenting a north and south aspect. Upon the north side plant the latest kinds of strawberries, and the earliest kinds on the south side; thus producing a very early and very late supply, so that an unusually long strawberry season may be advantageously and economically effected. Strawberry plants growing on steep banks, unless they are well and regularly supplied with water in dry weather, are sure to suffer, and that frequently to the extent of the entire loss of the crop. The usual mode of supplying these banks with water is by the watering-pot, when it runs off nearly as fast as it is poured on. An improvement in erecting these beds will be understood from the next sketch. Draining-tiles, in the form represented at *d*, can be readily procured at a low price, and the more porous the better, thus permitting the water to filter gradually through them to the earth in which the plants are growing. In forming these beds, a ridge of stones or flints may be thrown up, as at *a*, and then covered over with good rich loam, as shown at *b*. The bed then should be covered over with brickbats, stones, or flints, as represented at *c*, and the hollow tiles, *d*, laid in level as the work proceeds. Some of the compost in which the plants are intended to be grown should be used in carrying up the covering. The plants will, from the moisture which is at command, root vigorously amongst the stones. There is, therefore, no reason why the strawberry may not arrive at as great, if not greater perfection, than in beds in the open garden; the stones will keep the fruit clean, and assist in accumulating the heat, and thus accomplish the desired object—earliness. By placing these beds near a pump, the water may at once be pumped into the gutters by attaching a small wooden shoot, thus saving the expense of carrying water. The tiles may be joined together by cement. The following cut shews in detail the method of building up the steps of such a bank. (*Gard. Chron.* 1845, 148.) In low damp situations, or where space is deficient, the advantages of this mode of culture will be evident. In waste corners, where even there is no soil whatever, a ridge may be built and cultivated successfully.



The following is a section of another manner in which a strawberry bank may be built.



Time of Planting.—The best period for making strawberry beds is from the close of July until the middle of October—the earlier the better—but this must be controlled by the rooting of the runners. If the planting be deferred until spring, they never succeed so well, and the produce that year is very small. Showery weather is the best for planting, and the less the roots are disturbed the better, which is the chief reason why inducing the runners to root in small pots

beneficial; they can be turned out of these without
y injury to the roots. (*Johnson's Dict. of Modern*
ard.)

We are not disposed to object even to earlier plant-
g than recommended above, and do not dissent from
e recommendation given by C. Wolseley, Esq., of
olseley Hall, Salop, to plant never later than the
2th or 14th of July; if not showery, water the run-
rs for a fortnight every day, until they have taken
ot; and then, if managed well, and some loose dung
attered over them in November, you will have a
op the next summer; instead of which, if you plant
e runners out in the old method—say in Septem-
er—you must wait till the year after for your first
rop. (*Gard. Chron.* 1841, 453.)

We would strongly recommend, in all cases where
can be accomplished, as the most safe and certain
ethod of securing a full crop of large fine fruit in
he following season, to lay the runners in small pots
s soon as they can be obtained from the old beds,
nd which may be safely followed up till the latter
nd of August; it is, upon the whole, not much more
ouble then planting the runners in the usual way: if
e runners are regularly watered from the time they
re laid in the pots, in the space of a fortnight, or if
loudy weather, even less time will suffice, they will
e ready to plant out, and one good watering will
en be sufficient; and the same pots may be filled

at least twice more with fresh plants. The progress made before winter by such plants will be far superior to any others planted in the usual way; and the certainty of a fine crop the following season will well repay any extra trouble or expense that may be incurred.

Selection of Plants.—The earliest rooted runners, from plants that have been good bearers, should be selected. It is also important to have them from exposed situations, such as the fields, or an extensive open garden. In such places they may be found very dwarf and strong; and the matter which feeds the fruit of the following year will be, to a certain extent, organized and ready. Moist showery weather should be chosen for taking up and planting the runners; and, where it is convenient, the roots of each plant should be carefully preserved. This is of the utmost importance in small, confined situations; as then the little ball of soil, which is necessarily removed with each plant, serves to nourish it probably much better than the soil in which it is planted. (*Gard. Chron.* 1842, 54.)

When the soil from which the runners are taken is so loose or light that none will adhere to the roots, a good plan is to leave a part of the stem of the runner about three inches long attached to the young plant, and to insert it into the ground along with the roots, which will keep the plants firm and upright till the roots are established.

Mode of Planting.—Do not allow the plants to be more than three rows in depth, but interpose a path half a yard in width between every phalanx of three rows, so that air and light may be fully enjoyed, and runners may be easily cut off when requisite; and also that a space may be allowed wide enough to walk down the beds, to get at the fruit. Having your ground marked out with a line, proceed to the old bed, and take up with a trowel the young plants which have rooted. Choose those which appear to be most strong and established. Then dig holes with the trowel along your line, and carefully deposit the plants in them, at the desired distances. As the strawberry has, even in its young state, a vast quantity of root fibres, the process of taking up with a trowel preserves these, and prevents the plants being much checked by removal. (*Gard. Chron.* 1846, 708.)

Never trample upon the beds.—To avoid this, even at planting time, insert each row of plants so soon as sufficient space for it is dug. Mr. Haynes is judiciously particular upon this point.

The ground being evenly dug, six inches from the end of the bed where a trench was first formed, with a straight staff or ruler as long as the width, and marked into equal divisions according to the number of rows, lay such ruler exactly across at each end, reaching within about three inches of the side of the bed, gently pressing it upon the fresh-dug earth to form a line for the reception of the first rows of plants; when, with the finger, make a mark opposite each place where a plant is to be inserted on the side towards you, then, with either the hand or a trowel, form holes by drawing the soil towards you, each sufficiently large to receive a plant with its entire root, and return the soil to make even the surface about the plants. Provide two equal measures of such length as the rows are to be apart, to apply to each side of the bed; and having dug the ground sufficiently far to receive a second row of plants, mark out the line across with the ruler as before; and plant so that the whole assumes the quincunx order, by which is intended four plants formed in a square, and the fifth placed in the middle, thus $\overset{*\;*}{\underset{*\;*}{*}}$. The entire length of ground being planted, earth up, with a spade, each end of the bed and the sides, to form an even, regular, and complete embankment, four inches above the surface throughout, the better to retain all copious waterings and heavy rains. On the planting being completed, afford each bed a light but somewhat copious supply of water; and should the weather continue warm and dry in the autumn after planting, moderate waterings must be applied until the plants are well rooted. The embankment, on becoming impaired by severe frosts or winter rains, will require to be carefully repaired with the spade, early in the spring, or before the commencement of dry weather. (*Haynes on Strawberry*, 20.)

Planting the Hautbois.—The males and females growing on different plants, it is necessary to have some of the former, otherwise there will be no fruit. Of the females, to insure success, you must select your runners from those only which bear fruit, rooting out all others. The following is a good plan of forming a bed of Hautbois strawberries. It is in quincunx.

Females.   Females.   Females.
*   *   *
Males.   Males.
*   *
*   *   *
*   *

(*Gard. Chron.* 1846, 740.)

A variety of the Hautbois, sent out by the Horticultural Society of London some years since, under the name of the Prolific Hautbois, has flowers which are all fertile, and producing large crops of very fine fruit. In favourable seasons we have seen an excellent second crop produced from this variety in the autumn, from the runners being allowed to remain on the bearing plants; indeed, some of the best crops *we have seen* were grown on the runners of the previous season, being allowed to remain on the beds, giving them a slight top-dressing in the spring. The fruit grows much larger and finer on the young runners than older plants. The mode of culture recommended for Myatt's Pine, which will be given in a future page, will also apply to the Hautbois.

Mr. Mackintosh has stated that one male plant will fertilize ten females. It often occurs, however, that the male plants fail in flowering, and sometimes bloom after the females have set their fruit: a failure in the crop is a certain consequence. The Hautbois strawberry is capable of being fertilized by other kinds; and it has been here proved that the Russian Alpine is best adapted for this purpose. This kind flowers from May until the end of October. The Hautbois and Russian Alpine should be planted in well-prepared ground, in alternate rows, two feet apart. By these means a good crop of large well-flowered Hautbois is obtained; and the Russian Alpine will continue to bear until destroyed by frost. (*Ibid.* 1842, 853.)

AFTER-CULTURE.—The chief points to be attended to are, freeing the beds from the weeds at all times; removing the runners when necessary, and at proper times; giving water when required; and manuring.

Removing the Runners.—The late President of the Horticultural Society was never more correct than when he warned gardeners that taking off the runners is not expedient under all circumstances, but that it must be done with judgment and caution; for every runner is, in its incipient state of formation, capable of becoming a fruit-stalk, and if too great a number of the runners be taken off in the summer, others will be emitted by the plants, which would, under other circumstances, have been transmitted into fruit-stalks. The blossoms, consequently, will not be formed till a later period of the season, and the fruit of the following year will thence be defective alike in quantity and quality. (*Knight's Papers*, 284.)

It is especially inexpedient to remove the runners as soon as they appear from newly-planted strawberries growing luxuriantly, for in such case they very usually will produce nothing but more suckers and a profusion of luxuriant leaves. Indeed, we are of opinion that runners should never be removed from a strawberry plant until its fruit is set; and even then only such as are not rooted. Upon this point Mr. Woods has recorded some very just remarks. He observes that, when the plants shoot up into flower, they fling out their runners, each having a bud, or a young plant, in embryo, at the extremity, which, after being pushed forward to a certain length, strikes root into the soil, the leaves expanding at the same time; it is then able to generate sap for itself, and when it gets established, and gains sufficient strength, also pushes forth a runner, which strikes root, and again produces other runners, until growth is arrested by the season. This they will do if the connection between the runner and the parent plant is cut off or destroyed, providing the young plant is sufficiently established before this is done, and so will each bud do in like manner. We are alluding to plants grown in the natural ground, for, as a matter of course, those growing in pots for forcing have not an opportunity of taking root in the soil, and therefore these draw all their support from the parent plant. Hence the propriety of depriving those in pots of all their runners previously to and during the time of forcing. In the open ground, it will be observed that the young plant never fixes itself in the soil until its parent has pushed it forward to its utmost limit; this may be known from the connecting string lying always in a straight line if it meets with no obstruction: if, on the contrary, it increased in length after the young plant had become rooted, it would have to make a curve, more or less, according to the degree of elongation after the plant became fixed. This, at least, proves that it does not deprive the parent plant of its nourishment after having once rooted in the soil. (*Gard. Journ.* 1846, 422.)

Entertaining these opinions, and from lengthened experience, we recommend growing the strawberry in narrow beds, with wide paths between; or in good-sized gardens, where the quarters are large, one, two, or three beds made right through the middle of the quarter, so as to divide it into two equal portions for vegetable crops. This situation gives the full benefit of sun and air, and the vegetable crops will give shelter.

It has long been truly observed that there are many kinds of plants and fruits that will not grow in the shade of other plants or trees, which nevertheless seem to thrive best in a mass, where they can obtain the partial shade of their own foliage. The strawberry is one of these, and is always found naturally in masses. Acting on the above principle, make beds four feet wide, and three feet between the beds. Thus, while the plants in the beds run together, and enjoy their own shade, the breadth of the spaces between the beds permits a free circulation of air and heat. (*Gard. Chron.* 1842, 542.)

Strawberries thus grown upon a soil well-trenched never require watering, and by their own foliage protect their fruit from being splashed and dirtied by heavy rains.

Digging the beds.—Whether grown in masses or in separate stools, Mr Knight only spoke the warning of experience when he said the practice of digging between the rows is most objectionable; for by shortening the lateral roots in autumn, the plants not only *lose the true sap,* which such roots abundantly contain; but the organs themselves, which the plants must depend upon for supplies of new food in the spring, must be, to a considerable extent, destroyed. This mode of treating strawberry plants is much in use amongst country gardeners, and Mr. Knight amply tried it himself, but always with injurious effect; and from our own and all experience we can unhesitatingly pronounce it decidedly bad culture. (*Knight's Papers*, 284.)

Mr. Young, a very successful strawberry cultivator at Kippencross, N. B., observes upon this avoidance of the old practice, that an objection may be made; if the rows are not to be dug between, how are they to be manured, as they generally are allowed to remain a number of years in the same place? In answer to which it has been said, they should be planted in good, rich ground, which may be supposed to produce several crops before it is exhausted. But where it may be necessary to apply manure, it should be given in a liquid form. The drainings of a dunghill are excellent, and may be given any time in winter, if the weather is open, or in spring. Pigeon-dung makes a very good manure, when so slightly pointed or forked in as not to disturb the roots, at the time the plants get their spring dressing; the good effects of which will soon be visible from the dark colour of their foliage. But the most effectual method to have strawberries vigorous and fruitful, is not to allow them to remain too long in one place. The period will vary according to the soil. In light sandy soil, they will not stand good nearly so long as in deep loam: in the one they will do little more good after the third crop, and in the other after the fifth. On the first, they are at their best the second crop; on the other the third; after those periods, at an average, the produce will decline on both. The Hautbois and Chili kinds are exceptions to this, as they will continue a year or two longer in vigour, according to the soils they are planted in. Therefore, to have strawberries in the greatest perfection, a quantity should be planted every spring, in proportion to the soil they grow upon. That is, on light soils a third, and on heavier soils a fifth part, trenching or digging up the same quantity after the crop is gathered. But the proportions to be planted or dug up annually will be best understood by the person who has the management of them, as he will be the best judge at what time the deterioration of thier produce commences, which, in some sorts and situations, will be sooner, and in others later, as above hinted, after which period no art will bring them to their former fruitfulness; but the crop will continue to grow worse and worse every year, the plants losing that energetic power for the production of fruit they possessed when they were young, and appearing to expend their strength on a luxuriance of *oilage. The following* may probably be the cause.

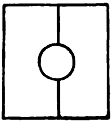
Every bud that is formed, either upon the plant itself or upon the runners, throws out radicles. These striking into the ground, draw additional nourishment for its support, besides what it may receive from its primary roots. But when an elongation of the plant takes place, which is the case in a few years, the buds which are situate upon the top of the plant, although they invariably emit radicles in quest of food, are, from their elevation, unable to reach the ground. Hence they wither and die off, without fulfilling the intentions of nature, and the plants being deprived of their secondary support, the deterioration of their produce naturally follows. Any person may satisfy himself of the truth of this by inspection. In young plants the radicles of the different years will be visible in distinct series one above the other. While, on the old plants, which are considerably advanced in height, there is none above the surface of the soil, excepting those of the present year, twisted and warped amongst the axillæ of the foliage in search of food, which are destroyed in the course of the following winter. (*Cal. Hort. Mem.* iii. 297.)

We quite agree with the above opinions, and long since recorded as the result of our experience, that the spade should never be permitted to enter among strawberries, except to dig them up when a bed is to be destroyed; the hoe, or at the most pointing with a three-pronged fork, is all the surface-stirring required, if the beds were well trenched when made, and have not been trampled upon. If they have been thus consolidated they had better be broken up.

Preserving moisture to roots.—Whilst the strawberry plants are kept in distinct rows, it is necessary to cover the surface of the soil with straw between the rows, or with the short mowings of grass, during the blooming and fruiting. This preserves moisture to the roots of the plants, and preserves the fruit from being dirt-splashed. Such coverings, however, are more or less harbours for slugs and other predatory vermin, and tiles of an appropriate form have been consequently suggested as a substitute. Short grass will be found to answer better than straw. It does not harbour slugs so much, for, as it withers, it lies so close and compactly on the ground that they cannot crawl under it; and, at the same time, the surface always remains dry and crisp, offering a safe and clean bed for the fruit to rest upon. This supposes, of course, that care is taken in spreading it not to lay on too much; enough to cover the surface of the ground, but not more, is all that is required.

Mr. Fairbairn was the first to make known this suggestion, and his directions are as follows:—

After the fruit is set stir the surface pretty freely, and put on an inch or an inch and a half of well fermented dung, and in case of dry weather give an *abundant watering* upon the dung or compost. Then immediately lay down flat tiles, with a circle, at least a half circle cut out of each tile, the surface of which has been painted black for absorbing the greatest portion of heat. First make your beds of light soil, with a small portion of fine bark of the oak, and put in your plants in the usual way, only observing to make the tiles cover the whole of the bed or pavement. You will find the night dews will be gatherd by each leaf and stem, and the tiles during the day will not only prevent the exhalation of moisture from the soil, but also collect a great body of heat from the sun, and consequently form the fruit early, large, and well flavoured, as well as clean from sand. (*Hort. Soc. Trans.* i. 84.)



Each tile should have a circle four inches in diameter cut from its centre, be 12 inches square, and in two parts, as in the accompanying sketch. They might be made for a very few shillings per 1000, and less than half that number would cover a bed six feet by forty. It would improve their assistant-ripening powers if painted with coal tar.

Shading.—During the blossoming, and even during the ripening periods, it is highly beneficial to have the plants shaded from the noonday sun. The fruit by this is rendered finer and the time of bearing is much prolonged. The shade may be obtained by growing rows of peas or other tall growing vegetables on the southern side of the bed, but the best practice is to have wattled hurdles, which can be set up and removed as circumstances render desirable.

Mr. Haynes gives the following directions on this point. Provide a sufficient number of light-wooded hurdles, five to six feet in length, and about three feet deep from the upper to the lower rail, when, with smooth branchy boughs of willow, or other light, straight, and pliable wood, six feet long, wattle each hurdle to the bottom, by fixing these boughs uniformly between the three rails of which the hurdle is composed, spreading the small branches in such manner as to admit between the wattle-work about one half the midday sun regularly throughout the bed. On the south side the bed or border of plants, place these hurdles in a direct line, as has been directed, first making holes in the earth with an iron bar to receive their pointed stakes, and with a mallet or beetle drive them into the ground, until the lower rail becomes even with the surface of the earth. To prevent their being blown down, secure them by fixing other stakes on the south side of the hurdles, taking care to keep them erect. Branches of willow, well furnished with long pliable side shoots, on account of their smoothness and lightness, and being attainable in most situations, are to be preferred to every other. (*Haynes on Strawberry*, 30.)

Autumn and Spring Dressing.—When the leaves are decayed in October, and other evidence is given by the plants that their season of storing up the means of next year's growth is passed, clear away, for neatness sake, the really dead leaves, and the runners that have strayed beyond the assigned bounds of the bed, or that are otherwise superfluous. It is a good practice to store up those dead leaves and runners in a heap by themselves, mixed with a little salt, and to use them with one-fourth of bone-dust for dressing the beds in the spring following.

On on account mow, or cut off close, all the leaves, whether dead or living, as is the old and barbarous custom. Strawberry beds so treated may continue to bear crops, but it is in spite of bad treatment, and the produce would be better if the practice was discontinued.

Dr. Lindley has fully exposed the folly of this unnatural practice in the following observations :—

The reasons in justification of this practice, assigned by the mowers, are the following, viz.: 1. That they get good crops; 2. That the beds are again covered with leaves before the winter, and are thus well protected at that season; 3. That a very neat appearance is secured; and, 4. That the buds for the next year are thereby rendered uncommonly plump.

That good crops may be obtained by mowing is what we will not dispute; for, on good strawberry land, we know that the beds will bear ill-treatment to a great extent; but in such cases, it may be that the crops are obtained in spite of the mowing, and not in consequence of it. The question is not whether good crops can be obtained with mowing, but whether better could not be had without it.

As to the beds being again well covered with leaves before winter, this is perfectly true; but what then? Rightly considered, this is one of the worst consequences of the mowing; for, if we inquire into the history of the formation of these new leaves, we shall find that they are produced at the expense of organizable matter previously lodged in the roots of the strawberry plant: that matter was lodged there by the leaves, which the mower destroyed, and was intended by nature for the food of the leaves and fruit of the succeeding year. Being expended in the production of autumn leaves, the store of food for the leaves of the next spring is, by so much, diminished. Doubtless such autumn leaves form a good protection in winter, but it is a protection bought at a great price, and not better, if so good, as would have been furnished by the old leaves, had the mower allowed them to remain.

We are far from denying the neat appearance obtained by the mowers, and if strawberry beds are made for ornament we should approve of this practice. *But the strawberry* is grown, we believe, to gratify the palate and not the eye. This is not a question about the manner of making a green edging, but of securing a crop of fruit. Finally, we fully admit the fact that when strawberry beds are mowed at this season, the buds do become very plump and fine looking: and so much the worse; for what is this plumpness, except the indication of an attempt on the part of the plants to throw up their flower-buds in the autumn, instead of reserving their strength till the spring? Surely it cannot be advisable to encourage such an attempt, which can only have the effect of rendering the buds tender and excitable during the winter, when they ought to be perfectly dormant.

Let any one look at the strawberry beds in August. He will find them covered with dark green healthy vigorous leaves, not exhibiting a trace of decay, if the beds are in good health. Those leaves are collecting the organizable matter which is wanted for the crop of next year, and that matter they are slowly depositing in the roots. Up to then they have not done much in this way; for at first they were occupied with their own organization, and then were called upon to feed the fruit. It is only after the fruit is gathered that they begin to collect and send down into the roots, in any considerable quantity, the organizable matter, or true sap, wanted for another season. By mowing them off, the gardener stops this essential operation; and it is physically impossble for him to do so without detriment to the future crop. The utmost that he can expect is to repair the mischief he has committed. But is that good gardening which commits mischief for the sake of repairing it?

VARIETIES REQUIRING PARTICULAR CULTURE.

Myatt's Pine.—This is the most difficult to grow of any of the varieties, but as it is also one of the most excellent in flavour, and a great bearer, it has obtained particular attention. It is found to thrive well upon rich light soils near the sea, but there or elsewhere we recommend the system of culture to be adopted which we will now proceed to detail, and which will be found to produce the most satisfactory results on all kinds of good strawberry soils, whether light or heavy, and which we have successfully practised for seven years past without a single failure, the crops being inferior to no other sorts, and the duration of the bearing season longer than that of most other kinds.

The chief point to be kept in view in the successful management of this excellent variety, is to produce a bed of any given size of self-planted runners, growing within two or three inches of each other all over the bed. When this is accomplished, a large crop of fruit will be produced from these runners with perfect certainty. For this purpose, care should be taken to place small (three-inch) pots filled with good compost, to lay the runners upon as fast as they are in a fit state for that purpose. If two runners are placed in each pot all the better. As soon as the runners are sufficiently rooted, which, if they have been carefully watered, will be in about a fortnight, let a bed be prepared of good rich soil (it can scarcely be too rich for this variety), four feet wide, as usual for other kinds. When all is ready, plant a row of the plants, turned carefully out of the pots, along each side of the bed: one foot plant from plant, and about six inches from the extreme edge of the bed, thus there will be a space of three feet between the two rows. The number of plants required for any given size of bed can thus be easily ascertained. A bed thirty feet long, for instance, will require sixty plants. Water once or twice after planting, and keeping them free from weeds will be all that is necessary till the following spring. About May, or just before the runners begin to push, give the bed a moderate coat of rotten stable manure, and point it in all over the bed, about six inches deep; in the course of the summer and autumn the bed will be thickly covered with strong healthy runners, which, without any additional trouble or care, will produce a large crop the following season. A single row planted right through the centre of the bed answers almost equally well, only the plants should be placed six inches instead of twelve inches apart. The manure should be pointed in two feet wide on each side of the row, and the runners spread out regularly on each side of the row will make an equally good bed four feet wide. The buds, with a good top-dressing, will bear a tolerably good crop the second and even the third season, yet it is highly advisable to make a fresh plantation every season, in order to obtain superior fruit with certainty. We have found that runners moved in the ordinary manner, without pots, although in the most careful manner, often fail to produce a good crop of runners, the plant being impatient of even the most trivial check; we, therefore, strongly reccommend the plan of using small pots for moving the runners to new beds. Myatt's Pine, when treated in this manner, we have found never to fail producing a large crop even on very inferior soils and situations.

Alpines.—The most extensive and most successful cultivators of the Alpine strawberry are the French, and as we know from experience that the system adopted by M. Morel de Vinde is excellent, and productive of large crops, we publish it without alteration.

In preparing for sowing the seed, make a hotbed of coarse litter; cover it with about six inches of good well-wrought soil. When the first heat of the bed is *nearly spent, sow the* seeds rather thinly, press the earth gently with the hand, and spread over the bed a light covering of moss (hypnum and sphagnum), which may be held down by rods extended along it, and water it moderately. Continue occasionally the moderate watering, so as to keep the seeds fresh. The moss possesses the double advantage of protecting the plants which come early, and of preventing the watering from ruffling and hardening the earth. As soon as all the young plants have vegetated, which will take place in thirty or forty days after they have been sown, take off the moss. It is now proper to shade them from the heat of the sun, and also to protect them from the cold of the night by means of mats. Water them only when it is necessary, and with a very fine rose, that the water may fall in a gentle shower.

The operation of transplanting the seedlings may be performed at any time, except at the end of autumn and during winter. The plants should not be lifted till about nine weeks after they have appeared above ground, which is about fourteen weeks after the seed has been sown. The ground on which they are to be planted should be well enriched with old hot bed dung; for, before being called upon to produce fruit for three years successively, they require an abundant store of nourishment to be laid up for them. They should be planted in beds 4-feet broad, that the fruit may be gathered with facility, and the plants dressed, without risk of being trodden upon. The stools may be placed in a regular quincunx order; one foot asunder every way. There will thus be four rows in each bed, the exterior rows being planted each half a foot from its edges. To make a strong and handsome tuft, three, or even four, plants, if they are weak, may be put into each hole. After this they must be frequently but moderately watered, and always with a rose. It is of course requisite to keep the strawberry beds free from weeds. But it is still more important—nay, even absolutely necessary—to cut off the runners, which, creeping about, overspread the ground with young plants. Nature, always more occupied in propagating the species than in perfecting the beauty of the fruit, seems to affect this mode of reproduction, and lavishes a great part of the sap upon the runners, to the essential detriment of the fruit.

Strawberry-beds thus managed produce excellent crops for three years successively, after which period it is proper to renew them in the manner explained above; and, for that purpose, it will be found desirable to plant one-third of the beds required every season, and, at the same time, to destroy the third part which has already produced fruit for three years.

Duration of Beds.—But a very few years have elapsed since strawberry beds were allowed to remain for ten or more years, until they became actually unproductive. Another system, and far better, was then introduced by the present excellent Dean of Winchester, Dr. Garnier. He recommended an entire fresh plantation of strawberries to be made every year, and succeeding experience has shewn that a modification of this practice is that which may be practised to most advantage, for it secures a better and less failing supply of fruit. This practice is to destroy one-fourth of the plantation annually, and to construct also annually another bed equal in extent to that fourth. By this method, by degrees, we obtain a plantation in four equal portions of one, two, three, and four year old plants; varying consequently in their degrees of forwardness, and increasing the chances of a good crop.

Mr. Keen, the fortunate raiser of the seedling which bears his name, and an extensive cultivator, had a tolerable crop the first year, an excellent one the second, and after the third year he destroyed the plantation. Those called Pine strawberries, such as the Old Pine, Keen's Seedling, Elton, &c., will bear well in the same situation for many years, if properly managed. That Scarlets are best when the plantations are frequently renewed is generally admitted; and there are some large varieties which appear to have more or less of the Chili in their constitution, as Myatt's Seedling, which require that runners be early established for bearing in the following season, as the old plants are apt to die off. As fruit can be obtained earlier in the season from plants that have not previously borne, it is advisable to renew some portion every year; but the propriety of annually destroying the whole depends very much on circumstances; and therefore the method cannot be recommended except in particular cases. Where it is adopted, it is of the utmost importance to root the runners as early as possible, either from plants established in the open ground, or from such as have been forced. Where practicable, it is one of the best plans to lay the runners in small pots. This plan has been known to insure complete success as regards a crop in the following season, when plantations made from plants not so rooted in pots have borne but partially. (*Gard. Chron.* 1844, 412.)

Packing Strawberries.—When strawberries have to be sent to a distance, each berry should be enveloped in tissue paper, and a good layer of cotton wool placed beneath every layer of fruit as it is arranged in the basket. The basket should also be shallow, so as not to admit of more than four layers of fruit. If tissue paper is not employed as above, the cotton is apt to get imbedded in the strawberries, rendering them unfit for use.

But by far the best plan, and that which we have adopted, is to have a box made of the required size, with thin boards, as false bottoms, to fit in, but not *rest upon each other*: these boards are bored full of small holes: through these holes the stems of the fruit are drawn, and fixed with a very small peg on the under side. The fruit is thus fixed all over the board nearly touching one another; the board is then fixed in the box. Another false bottom is then filled and placed above it, but fixed so as not to touch the lower one, and so on until the box is full. Fruit packed in this manner may be conveyed to almost any distance, if not too ripe.

Early Out-door Crops.—Keen's Seedling is the best variety for this purpose, and the following are all successful modes of hastening its early ripening of fruit. Mr. J. Williams, of Pitmaston, plants every year, early in August, some strawberry roots in close contact with the bottom of a south wall, at the point where the perpendicular of the wall forms an angle with the horizontal line of the garden soil. Each plant 16 to 18 inches apart, so as to allow the morning and evening sun to fall on it to the best advantage, as well as the mid-day. (*Gard. Chron.* 1841, 230.)

Mr. G. L. Smartt, of Enfield, effects the same object in the following manner:—

Fix on each side of the row of strawberries, just before they come into blossom, feather-edged boards at an angle of 50 or 55 degs. This may be effected by nailing two narrow slips of wood to each board, and pushing them into the ground. The boards should be painted black. This plan makes two or three weeks difference in the ripening of the fruit; but glass, or an oiled-paper frame, being placed on the top, makes a greater difference still, and prevents any of the fruit from being trod upon, or eaten by vermin. This plan, at the first sight, may appear to be an expensive one, but it is not so; any old boards will answer the purpose; and as they are only used in summer, they last for many years. The expense is saved in the first year, for the wood, although painted on each side with a coat of invisible green, costs only three half-pence the foot; while the increase of fruit in quantity, as well as in quality, compensates for the outlay. (*Ibid.* 1844, 870.)

We have detailed these various modes of forwarding out-of-door crops recommended by various writers, but, we would observe, now that glass is so cheap, structures of that material made to suit circumstances will be found superior and cheaper than all other contrivances whatever.

Retarding Ripening.—To prolong the season of this favourite fruit several plans have been suggested. We have tried, among others, to grow them on a border beneath a north wall, but never with any success. The blossoms were invariably few and unproductive. Other methods practised to retard this fruit are, first by planting them in the coldest part of the garden, *where they may* be as much in shade as possible, and the soil should be strong and cold; when there are such places in the garden, the fruit will be near a month later than in a warm situation. The next is to cut off all the flowers when they first appear, and, if the season proves dry, to water them plentifully, which will cause them to put out a fresh crop of flowers; and if they are supplied with water, there will be a late crop of fruit, but these are not so well flavoured as those which ripen in their natural season.

But since the Alpine strawberry has been introduced in the English gardens, there is little occasion for practising this method of retarding the fruit, because this sort will supply the table the whole summer, especially if care be taken to pull off the runners, and in dry seasons to water the plants, neglecting which the blossoms will fall off without producing fruit. (*Gard. and Flor.* i. 236.)

FORCING.

No plant is more certain of producing a good crop when forced than is the strawberry, if properly treated; and none will more assuredly disappoint the gardener's hope, after a fair promise, if he adopts the too common error of forcing too fast. The day temperature must be gentle, air must be admitted freely, and the night temperature must be very low, during the whole of the stages of the plants' growth, until the fruit is well set. *Afterwards* they may be hastened through the ripening process, but even great rapidity of growth then is not compatible with increase of size and high flavour.

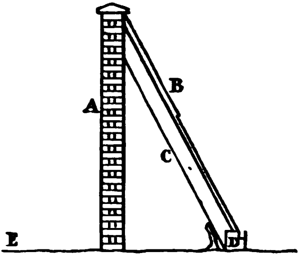
Upon the rationale of the above results of practice, Professor Lindley has made the following most just observations:—

Those who would understand the philosophy of strawberry forcing should begin by the beginning, and first determine what it is which they have to deal with. This can only be ascertained by examining the young flower buds as they exist in the plant when it makes its first move towards the growth. At that time they are collections of tiny scales, placed over a small spongy centre. By degrees they acquire the forms of calyx, corolla, stamens, and pistil. They form successively in the order in which they are named, the calyx first, the pistil last. The calyx and corolla are the most simple, grow the quickest, and most easily bear to be hastened; stamens require more time for growth; the pistil most of all. When high temperature night and day, with abundance of moisture, and as much light as February yields, are suddenly applied to the strawberry, it is compelled to grow; the predetermined parts advance, and, obedient to the influences which their nature cannot disregard, *they by degrees unfold*; but how? The oldest parts, namely the calyx and corolla, simple in structure and already advanced in their formation, suffer no injury, but appear in their usual state, arraying the blossom in gay apparel of white and green. The next, however, the stamens, having less time to form, acquire perhaps their yellow colour, but are powerless for their allotted office; while the pistil, the most complicated of all the parts, that which demands the longest period for its perfect formation, but which is the latest that the flower produces, and which it to become the fruit, is a mere tuft of abortions, incapable of quickening, and shrivelling into pitch-black threads as soon as it is fully in contact with the air.

All this was long ago proved by Mr. Andrew Knight, although the rationale was not explained. That admirable experimentalist found that when melons were forced too fast they bore nothing but male flowers: and that cucumbers, if grown very slowly, produce nothing but females. That is to say, the excessive growth which he obtained gave the complicated females no time to organize; but was enough for the preparation of the males, whose structure is more simple. On the other hand, when growth was preternaturally slow, the period of gestation was so long that all the parts of the flower which, under a higher and quicker stimulus, would have become males, fashioned themselves into the *complicated* condition of the females. Nature works neither to the one extreme nor the other; her's is the middle course, which alone can lead to perfection. Let those who would understand her processes, look around and consider how it is that the strawberry is made to bear fruit naturally. Does the cold of winter suddenly change to the heat of the dog-days? Does warm dew incessantly bathe the rising herbage? Are the nights of spring more oppressive than the days? Where the strawberry dwells the temperature rises very slowly, and at about the same rate as light increases. If one day is warm another is cold, and the nights are always so. The air, too, is dry more often than damp. We had almost written dried, bearing in mind, as we do, how ceaselessly the east wind breathes upon the land of strawberries. Three long months of steady growth are required to produce the strawberry under these favourable circumstances. How, then, can we imagine that in six weeks the same end is to be accomplished by unnatural means? No, no; we may assist nature: we cannot compel her. (*Gard. Chron.* 1847, 235.)

Forcing Structures.—The usual hothouse in which the strawberry is forced is the pinery, grapery, or peach house. These answer the purpose very well, if the plants are so placed as to enjoy unshaded light, but there is no doubt that a hothouse built purposely with very steep front sashes is very much preferable. *The following sketch* is similar to one erected by Mr.

Wilmot, of Isleworth, and so advantageously known as a strawberry cultivator.



A, the back wall; B, the glazed sashes; C, rafters supporting tiers of shelves on which the pots of strawberries are placed, so as to be close to the glass; D, the parapet wall upon which the sashes rest at bottom; E, the ground level.

To those who can only command the use of a single hothouse for forcing strawberries, where a stronger heat is required to be kept up than is suitable for the strawberry, still, with careful management, a good crop may be depended upon. On first introducing the pots they should be placed low down in the front platform, where flowering plants usually stand; here they will not require so much water as when placed in the full sun on the back shelf, where the temperature is always from five to eight degrees higher; they may remain in this place till they begin to show their blossoms, or even till it has attained two or three inches in height, when they can safely be removed to the shelves near the glass. If the plants were in good condition previous to introduction, they will rarely fail in producing good crops, even at a time of the year when little or no air could be given; much depends upon careful watering for the success of a crop, a little, morning and evening, is the safest plan, avoiding extremes. Soft or rain water, of a milk warm temperature, is, upon the whole, all that is necessary in all the stages of forcing, if judiciously applied.

Those who possess pits heated with hot-water pipes and tanks under a solid stone floor, will find this structure superior to all others for strawberry forcing. Let a temporary wooden stage be erected over the floor and near the glass, strong enough to bear the weight of a man. Every part of the pit can be fitted up with the stage, so that no room may be lost, as all watering, &c., may be done from the outside. When forcing commences begin with the tanks only, keeping the floor gently warm, occasionally pouring in water upon it to keep the atmosphere regularly moist, giving little or no water to the plants for the first few days; in the course of three weeks or a month the fire may be lighted for the pipes, but much will depend upon the state of the weather when to begin *with these.* A pit of this description will be found to possess every requisite for strawberry forcing: it can be used for any other kind of crop which may be wanted, the stage being so constructed that it may be taken out readily and stowed away till wanted the following season. The following is a structure of this kind, built purposely for forcing strawberries, furnished by Mr. W. Nott, foreman at Taunton Nursery.

The pit most suitable for this purpose should be built with a four-inch brick wall, sunk eighteen inches below the surface, four feet high at the back, two and a half feet in front, and four feet wide, with a trench eighteen inches wide, and the depth of the pit, both at back and front, for linings. The pit must be filled nearly to the top with new bark, properly prepared. When the heat is risen and the bark settled, a sufficient quantity of old bark should be placed upon it, for the purpose of plunging the pots. This being done, and care taken not to have them more than six inches from the glass, very little air must be given until they begin to grow, when more must be admitted, but sparingly, taking care to give a sufficient quantity of water to keep them in a growing state, and taking off all runners as they appear. In this manner they must be treated until they produce their flower-stems, when they must have a larger proportion of air, in order to keep them from growing weak. When the flowers begin to expand, as much air must be given as the weather will permit, and every attention must be paid as to keeping them supplied with plenty of water, and with a heat from 65 to 70 degs., which must be kept up by repeated linings of hot stable-dung both at back and front of the pit. The compost suiting them best, is three parts rich maiden loam, and one part well-rotted horse-dung, thoroughly mixed together, and used as coarse as possible, with five or six large potsherds in the bottom of each pot. If this work is begun at the above-mentioned time, and the rules here laid down are strictly attended to, the operator will be able, early in April, to gather plenty of well-ripened fruit. When the plants have done bearing, if the gardener has no plantation from which to procure plants for the following season, they may be turned out of the pots, and planted upon some rich ground in a shady situation, where, with plenty of water, if the season proves dry, they will make fine young plants by the following autumn. (*Gard. Mag.* ii. 392.)

Plants for Forcing may be either one-year-old, or from runners of the same year. The latter are usually employed by gardeners; that is, they select the early runners of one season to place in pots for forcing in the following spring. Instead of these we prefer Mr. Knight's plan, and select, as soon as their fruit has been gathered, the roots which have borne *one crop of fruit*, but which had been planted too closely in their beds to be retained there long with advantage. The roots of these, with a good deal of mould remaining attached, retain as perfect as practicable; but their branches reduce to three, at most, in the large varieties, and to four in the smaller; and the plants place so deeply in the soil, after their old and decaying leaves have been taken off, that their buds alone remain above it. Employ soil of extremely rich quality, and give water, holding manure in solution, rather abundantly to the pots; the plants afford a more abundant crop of fruit, and of superior quality to that which could be obtained from younger plants. A single plant of this kind will be found sufficient for each pot, the size of which must be regulated by the habits of the strawberry. (*Knight's Papers*, 290.)

If runners are employed, it is important to select them from fruitful vigorous parents, and to be careful that they are themselves well-rooted. As plants not only acquire habits but inherit them from their parents, we have no doubt that some importance attaches to the practice adopted by the gardener at Willan Hall, East Barnet, Mr. Halley, who obtains the plants from those that were forced the previous spring. This he can always do, as he invariably turns the forced plants out into the open ground, soon after they have done bearing. He says that plants so treated produce excellent runners, and bear an abundant crop *late* in the season. (*Gard.* Chron. 1844, 261.)

A plan somewhat analogous to that adopted by Mr. Knight is recommended by Mr. Paxton, for he gives the runners a year's growth before he commences forcing them. His system is as follows. Strong runners are taken up in September, and planted about six inches apart, in matured and well prepared beds four feet wide, in a somewhat sheltered situation; here they are allowed to remain until the following July, during which period they must be kept very clean from weeds, have the flowers and runners regularly pinched off, and be watered whenever likely to suffer from drought. About the middle of July, they are potted in small 32-sized pots, two plants in a pot, taking the greatest care that neither roots nor leaves are damaged in the operation, and an important part of it is to press the earth firmly about them: the soil used is two parts loam, to one of well-rotted dung. Beds which will hold five or six rows of pots are then formed in the following manner:—level the surface of the ground, and spread upon it a layer of coal ashes; drive down a sufficient number of stakes to form the bed, to which must be nailed firmly slabs, or any rough boards, as wide as the depth of the pots, which are then to be plunged to the rim in spent bark or ashes. All that they will here require is attention to watering when necessary, and a slight protection with fern or other light covering during severe frosty *weather. Preserve* some of the latest forced plants of the above description, and after having carefully reduced their balls, repot them in large 32-sized pots in July, treating them afterwards precisely as the others. These, by having their buds formed early (through the slight forcing they have received), and becoming very strong, are admirably adapted for the first crop, and always repay for the extra trouble. (*Gard. Chron.* 1843, 480.)

Mr. J. Flinn also uses one-year-old plants, obtaining and treating them according to these directions. Put a little old tan and some leaf mould, early in the spring, or in the latter end of April, between the rows; the runners root freely in it. Take them up about the middle or end of July, when they will be pretty well rooted, and plant them into a nursery-bed, about four or six inches apart, and pinch off all the runners and blossom-buds as they make their appearance; then lift them carefully, and pot them into six-inch pots, and plunge them until they are wanted to be taken in for forcing. (*Gard. Journ.* 1847.)

Mr. J. Cuthill takes off the runners of Keen's seedling as soon as they are well rooted, and plants them in a bed of prepared mould, where they are regularly watered during the autumn; then, towards the month of February, the plants are taken up with good balls, and planted into a frame or pit, eight or ten inches apart each way; after which they are gradually brought on; and, after the fruit is set, they will thrive well in a bottom-heat fit for the cucumber; and, by keeping them moist, it is astonishing how fast the fruit will swell. Each plant brings to perfection double the quantity that can be grown in pots. It must be observed that plants, two years old, produce more in quantity, but not such fine fruit, as newly-rooted runners. (*Gard. Mag.* xiii. 310.)

Another mode is, some time either in March or in the beginning of April, to take up of the last year's runners as many as will fill the requisite number of pots; but, instead of planting them in a continued bed, as commonly practised, let them be planted in single rows around the quarters of the garden, and as much exposed as possible; by which means, instead of having weak drawn-up plants, with very small hearts to produce fruit, they will be strong and firm from exposure, and produce abundantly. Any time in September let them be taken up, with as much earth as will adhere to the roots, and potted in good loam; that from the old melon beds will do very well, with about one-fourth of the old dung mixed with it. It is a common practice to put them three in a pot (size 32); but plants treated in this way will frequently be so strong as to allow only of one; this must, therefore, be regulated by their strength. When the plants are taken up to pot, the leaves ought not to be *cut off, except* any very straggling ones. (*Ibid. vi. 692.)*

Promoting the Rooting of the Runners.—Instead of using older, strengthened stools, as described above, the most usual practice is to employ plants for forcing in the spring, raised from runners potted the previous summer. The only extra attention paid to them is to aid their early rooting, and as there are many modes of doing this, all adopted by practical gardeners, and all offering some good available suggestions, we shall give them in detail, even at the expense of some repetition.

Mr. W. Mitchener, gardener at Courtlands, near Exmouth, about the beginning or latter end of June, according to the forwardness of the season, takes a sufficient number of pots, of about five inches in diameter, filled with very rich loam; plunges them to the brim in lines four or five inches apart, in the spaces between the rows of bearing plants in the open garden. But should the plants from which the stock of forcers are to be taken be not in beds, but in continued rows, without alleys throughout the quarter, which is frequently the case, it will then be best to have two rows of pots plunged as above in every other space, and the space left will serve to walk and gather the fruit, and occasionally water the plants, particularly those that are in pots, which, while they are in this situation (and this may be the case from two to four weeks), will require regular attention as to watering, in order to forward them as much as possible. When the runners of the old plants make their appearance, and are just beginning to throw out roots, he selects the strongest and most promising; inserts three of these into each pot, close round its sides, so as to give them all the room possible. They may be fastened down with hooks, such as are made use of in layering carnations; or a small stone, about the size of a walnut, may be laid upon each, which will answer the same purpose. The runners will generally establish themselves in a very few days, the stone may then be taken off, and used for others which were not so forward. Great care must now be taken to divest the young plants of all future runners. When these small pots are filled with roots, and before they become too much matted, it will be time to detach the runners from the old plants; and pot them into pots of the usual size, say seven or eight inches in diameter, according to the sort of strawberry, being careful to turn them out without disturbing the roots; and then plunge them again to the brim in an open part of the garden, to remain till the season of forcing. Paying due attention to watering, &c., they will be in fine condition for that purpose, and greatly superior to those treated in the usual way. (*Gard. Mag.* ii. 390.)

Mr. Williams, of Pitmaston, adopts a mode differing from the preceding chiefly in the number of *shifts*. *In the* beginning of July, or as soon as any *runners are observed* to be sending out roots in the beds in the open ground, a very small pot is placed under each plant, and a small stone placed on the runner to prevent the young plant being removed by the wind. The pot is filled with light soil, and mixed with decayed vegetable matter; if dry weather, these pots are watered every evening. The plants soon take good root, and are then repotted into pots a size larger, with similar good soil, are placed on a southern border fully exposed to the sun; no runner being allowed to grow, and they are carefully watered in dry weather. A third potting takes place in the middle of August; and the fourth time, about the middle of September, when the plants are removed to the pot in which they are to fruit, where they remain on the south border till severe frosts commence in November or December; the pots are then removed to the floor of a cool peach-house, and preserved from severe frosts till vegetation begins to shew indication of spring in February. (*Gard. Chron.* 1845, 560.)

Raising Plants in Turf.—This is the plan recommended by Mr. A. Bisset, gardener at Methven Castle, N. B., who says—

Turf may be employed with advantage in the forcing of strawberries, by means of which the use of pots might be altogether dispensed with. This will be evident from the following description. At the proper season for planting the strawberries, let a small piece of ground be formed into beds about four feet wide, and a quantity of turf be taken and cut into pieces of about five or six inches square, which should be placed in a regular manner over the surface of the beds. A quantity of fresh loam, richly manured, should uniformly be applied to the surface of the turf, previous to planting; and, in order to furnish large stools, four or five plants should be separately planted in each piece of turf. This may be done to best advantage in the early part of the spring season, with plants taken from the runners of the preceding year; or it may otherwise be accomplished with good effect in the end of summer, with plants selected from the runners produced the same year. If due attention be paid to watering in dry weather, the plants will be found to grow vigorously, so that, by the end of the autumn season, their roots will be fully established in the turf, and they may therefore be removed to the forcing-pit with nearly as little injury done to them as if they had been planted in pots. It will be readily perceived that, in this case, the strawberry plants, with their roots in possession of the turf, must of necessity be planted in a ball of earth or decayed compost, prepared in the forcing-pit appropriated for that purpose. In regard to the kind of strawberry fittest for our purpose, Mr. Bisset thought the Roseberry the most valuable for the turf mode: though it *can by no means* be allowed to be the earliest, nor *the best in point* of flavour, yet it is a strawberry which invariably yields a plentiful crop even the first season after planting, which, independent of its other properties, renders it a most appropriate strawberry for being forced. But it may nevertheless be stated, that all such kinds of strawberries as are capable of being forced with advantage in pots, may be done so likewise with turf; for, if it be taken from a stiff soil, it will last for two years; and at the end of that period it will still be found to possess its adhesive or binding properties. (*Caledonian Hort. Mem.* iv. 186.)

Mr. J. Murdoch gives the following directions. He says, take the best runners you can find in the month of August; plant three in 24 or 32-sized pots, according to the size of the plants. Prefer wet days to take the runners up, as the mould adheres best to them. Place them, if it should be hot weather, behind a north wall for eight or ten days; after which, plunge them in an open part of the garden, in the common soil, up to the rims of the pots. The gardener to Sir William Folkes, a successful forced-strawberry grower, used to recommend taking the small runners in the month of September, and potting them, as he frequently found the earliest ones had a disposition to come into bloom in the autumn; and the best crop Mr. Murdoch ever remembered to have had was on an occasion when the want of pots compelled him to put off potting the runners till the first week in October; when, fearful that they would not have time to make many roots before the season was over, he filled a frame with fresh horse-droppings, and plunged the pots therein, but without covering them with lights. This was the usual custom of the late Mr. Press, long gardener to Mr. Gray, of Hornsey, who, besides supplying the wants of his master's family, could send a great many to market; and the chief place he had for growing them in was upon some shelves in front of a peach-house. The chief cause of failure in forced strawberries arises from their being introduced into too warm a place. (*Gard. Chron.* 1843, 542.)

Potting unrooted Runners is a very excellent mode. As soon as the runners are produced, and they show signs of rooting, which will be at a very early age, prepare a frame of one or more lights, as may be required, an old cucumber bed or pit with only a little heat remaining in it will be sufficient. Pot the runners singly into small sixties, taking care not to bury the crowns; and in order to make them firm in the earth, a piece of the runner may be left below the root, which will hold them till they are rooted, and which takes but little time to accomplish in such a favourable situation. Having potted the required number, set them as thickly as possible all over the bed, *keep the frame* close, and shade them when necessary, *till* they are rooted, and will bear the sun without flagging. Increase the quantity of air daily, till they will allow the light to be taken off. They may then be potted into the sizes in which they are to fruit, and plunged in ashes or other materials till they are wanted, taking care not to plunge too near together. It will be seen that as they only occupied the frame a fortnight, the same frame may be used two or three times if required. Another advantage over layering is, that plants may be procured much sooner for very early forcing, as by leaving as many runners as may be required on those which are forcing, they may, when sufficiently grown, be struck and potted before out-door runners can be procured. (*Gard. Journ.* 1845, 362.)

Although Keene's seedling and the scarlets are usually employed for forcing, yet other varieties will bear this treatment. For example, Mr. G. Meredew, gardener to C. Calvert, Esq., of Whitton, gives the following account of his plan of management in forcing the Roseberry strawberry, which unquestionably had been particularly successful. Runners were placed two in a pot early in July, and the pots were left in a shaded situation till the end of the month, they were then plunged in an open quarter of the garden till the end of September, having been regularly watered during the whole time. At this period they were repotted, one plant only being put into a pot, and transferred with as much earth as possible attached to the roots. The pots were then set under a frame, with a little bottom heat, being supplied daily and regularly with air, and kept thus till the end of November, when they were moved into the pine stove. The fruit began to ripen early in January. (*Hort. Soc. Trans.* vi. 539.)

Treatment after Potting.—The best system which is adopted in many places where large quantities are forced, and that to the greatest perfection, is to keep them, from the time of being finally potted, plunged down to the rims of the pots in beds of sand—a south aspect is preferable; and where the ground will allow, the beds should have a fall of eighteen inches or two feet, but this must be regulated according to the length of the beds. If fine strawberries are wanted, the potting off the plants should be completed early in August, so that the pots may be filled with roots before winter, as on that the success of forcing solely depends. (*Gard. Chron.* 1844.)

After October they are to be kept from frost under glass, only drawing off the lights in fine weather, and tilting them in wet; with such protection the leaves retain their colour, and the roots continue growing throughout the winter, a condition most desirable for any plant about to be introduced to the forcing house. Wooden troughs are better to place the pots in than pans upon shelves; if these are suspended from the rafters, for the plants cannot be too near to the glass, and the spaces between the pots filled with rotten dung, the roots run amongst it, and derive a more genial nutriment therefrom than they could possibly do from stagnant water. They should always be kept near the glass, but not under the part where air is given; the temperature of any well-managed forcing house suits them. (*Gard. Journ.* 1845, 344.)

Plunging in Water.—So far is Mr. A. Norton from objecting to the pots being kept in saucers of stagnant water, that he gives these directions, which we would warn the reader, however, that we have never tried.

Place the pots for forcing in troughs two inches in depth, and seven in width. The nearer they are placed to the glass the better. The troughs ought to be well painted to make them waterproof, and should at all times be kept full of water. Thus treated, the plants will be found to thrive and swell their fruit much better than by any other method; while the pots being surrounded with water, creeping insects are prevented from getting to them, and injuring or eating the fruit. Kidney-beans treated in this way answer exceedingly well, grow much quicker, and are less subject to the red spider. (*Gard. Mag.* ii. 393.)

Temperature.—This is the most important circumstance to attend to in forcing the strawberry. Beware of its rising too high. Begin forcing with a day temperature of 45 degs., increasing this to 55 degs. when the plants are blooming, and from 65 to 70 degs. whilst the fruit is ripening. The night temperature must be 10 degrees lower than that of the day. In bright sunny days the temperature may be always 5 degs. hotter than during cloudy days.

One very good authority gives these directions as to the temperature and other culture to be employed.

Strawberry plants forced in pits, taken in at the time required, ought to be placed on a gentle bottom heat, and allowed no fire for at least four weeks afterwards, in order that vegetation may be brought on by degrees; for the same reason it should be observed not to put on too large fires at first, but merely as much as to effect the top heat a little, increasing gradually afterwards, till the temperature rises to 60 degrees, at which it should be kept nearly stationary, with allowance for the state of the weather, until the fruit is set; it may then be raised to 70 degs, according to circumstances. These plants never succeed well at a great distance from the glass, but grow tall and weakly, and for the most part produce untimely flowers, which never set, or at least set very partially. They should therefore be placed as near the glass as possible; it is desirable to have the pots set on pans or turves, placed on stages, as soon as the fruit is set. The plants must be freely watered with pure *tepid water;* air should be given each day to as great an extent as the state of the weather will admit. If beautiful coloured fruit of an ounce weight are to be looked for, twelve fruit to each plant will be sufficient. It is a matter of great importance to run along the plants with a common bellows, when in blossom; this disperses the pollen and promotes impregnation. (*Gard. Journ.* 1846, 247.)

Thinning the Blossom is one of the most effectual modes of obtaining not only fine fruit, but an abundant and regular crop. Mr. Fleming, the very able gardener at Trentham Hall, says, that there the forced strawberries, when in flower, are pruned to ten blossoms, so that each plant produces ten fruit, all of which ripen at the same time, and are, for the most part, of equal size; the whole truss is cut and sent to table in the same manner as a bunch of grapes. This is a great improvement upon the usual practice of picking the fruit singly, which makes it very difficult to handle them in any other way than by touching the fruit; and this, for many reasons, is most objectionable. (*Ibid.* 1846, 229.)

Improving the Flavour of the fruit is an important point in forcing strawberries. The hurried development of the parts, and their consequent inability to elaborate the sap as completely as during their natural period of growth, is the cause of its diminished flavour.

The fruit, as is observed by Mr. Williams, of Pitmaston, however beautiful to the eye and acceptable in April, a season of the year when fruit is scarce, is always watery and flavourless. To obviate this, Mr. Williams, at the end of the first week in May, places the pots on the surface of the front border outside his grapery (not plunged in the ground). Ten days' exposure to light and free ventilation gives the fruit a fine colour and a very high flavour, much exceeding the flavour of Keen's strawberry grown in beds in the open air. (*Gard. Chron.* 1845, 560.)

Second Forced Crop.—It is quite possible to obtain this from the same forced plants, soon after they have ripened their first crop, and before the produce from the natural ground plantations is ready for table. To effect this, Mr. Williams gives these directions:—

To keep the plants in vigour, as soon as they have ripened all the first crop and begin to shew their second blossoms, give them one watering of the black stable-yard water, carefully removing all runners. This brings out a second crop of blossoms and fruit as abundant as the first. The fruit affords a supply till the middle of August. If you have no black stable-water, use some guano, say a garden-trowelful in a three-gallon water-pot, and let it remain and soak a few hours; the plants, in the middle of August, to have one more watering of this liquid manure, which produces a third crop of blossom and fruit. Early in *October the plants* to be carefully turned out into the open ground for this summer's crop, where they continue to shew flowers till put an end to by frost. And, what is very remarkable, the plants treated as above are often more luxuriant the next year, the leaves of a darker green, and afford a large crop of fruit in the open ground. (*Gard. Chron.* 1845, 560.)

Second Crop in the Open Ground.—Mr. Knight observes, with truth, that every gardener knows that plants of Keen's Seedling strawberry, which have been forced early and properly in the spring, will afford, if turned out of their pots into the soil, and properly watered, a second crop in the autumn. These plants have usually a good many runners attached to them, which readily emit abudant roots if placed in close contact with the soil and plentifully supplied with water; and the plants which may be obtained with these runners are greatly preferable to those which cannot be obtained till a much later period. They occupy more perfectly the whole extent of the pots in which they are planted, and acquire a much greater degree of strength and maturity during the summer and autumn than plants of inferior age; and they consequently afford more abundant and more early crops, and fruit of a larger size, than are produced by younger plants. (*Hort. Soc. Trans.* ii. 175.)

Sometimes the blossoms of the forced plants when *planted* in the open border, do not make their appearance until as late as September; they are then too late to ripen their fruit without shelter, and Mr. W. Godwin says that if they are carefully taken up, without disturbing their roots, and are planted in pots filled up with the same soil, and placed in the pine frames, they will begin to ripen their fruit in October, and continue bearing until Christmas. (*Gard. Chron.* 1843, 711.)

Wintering Forced Plants.—The same plants may be forced prolifically for two or more years; and a repetition of this treatment has been extended over to five years; but some directions are required as to the best mode of wintering them. For this, pots of strawberries should always be plunged in earth or old tan; for if the sides of the pots are freely exposed to the intense cold of a very severe winter, the roots are sure to be frozen, and then the plants are unable to form their fruit. If placed under a south fence, and a wattled hurdle is placed over them during very severe weather, and during heavy rains, this will effectually shelter them. Mr. W. Wright, gardener at Wanstead Grove, recommends them to be removed from the open ground to a well sheltered situation, and to pack them up in the form of a ridge, similar to a large celery ridge, covering them with thatched hurdles, or any loose litter, never suffering the mould during this *their dormant* state to become frozen. Place the pots on their sides that the mould may not become saturated with rain or snow. Previously to bringing them into any forcing department, such as an early vinery or peachhouse, make up a bed composed principally of leaves, and plunge the pots there in order to start the roots, never covering them up, except in very bad weather, and barely keeping the frost from them. This is a very material point in the forcing of the strawberry. (*Gard. Journ.* 1845, 284.)

Other Systems of Forcing.—In addition to the course of culture we have already followed through all its details, there are others offered by some very eminent gardeners which it would not be just to pass over with a slight notice, we therefore give them in detail.

Mr. Paxton, the eminent gardener at Chatsworth, has published the following:—

Select for this purpose, early in August, a sufficient number of the best runners from approved kinds to have choice from, and plant them six inches apart in beds, upon a strong border in a dry and sheltered situation. As soon as the leaves have withered, mulch them lightly with well-rotted manure, and if very severe weather occurs, protect them for the time with fern or litter. They must be kept the following spring free from weeds and runners, removing also any flowers as they appear. Towards the latter end of May, or beginning of June, whenever dull or rainy weather may occur, remove them carefully into 48-sized pots; it is optional with the grower whether one, two, or three plants are put in one pot, according to his object being quality or quantity; but we, desiring fine fruit in preference to number, only place one of the strongest, or two of the weaker, in one pot, using enriched melon soil or turfy loam; place them, when potted, in a situation where they can be readily shaded for a short time, and receive regular supplies of water if necessary. About the latter end of July, or early in August, these pots will be filled with roots, when the plants must be repotted into flat 32-sized pots, usually termed strawberry pots, and at this time plunged in old tan or coal ashes; the best manner of plunging them we find to be, forming beds wide enough to contain five rows of pots (when plunged), upon a hard or gravelly surface, to prevent them rooting through, by framing in spaces of the required size, with outside boards or slabs, of the same width as the depth of the pots, and filling them up with old tan or ashes; the plants remain here until wanted to take in, and are easily protected from severe frosts. It will be found an excellent plan to preserve the latest forced plants, which are not much exhausted, for forcing the first the next season, these, from their long period of rest and well-ripened buds, are predisposed to break earlier and stronger than the others; some of them, if the autumn is moist, will be excited and produce flowers, which must be immediately pinched out: they should have their balls carefully reduced, and be repotted in larger pots early in August, protecting them from the late autumnal rains, and from frost. (*Gard. Chron.* 1841, 536.)

Mr. J. Brown, gardener to Lord Southampton, at Whittlebury Lodge, remarking upon Mr. Paxton's recommendation, says, that the above method for preparing strawberry plants for forcing is a good one, where time and trouble is of no consequence, but he has for the last 15 years adopted a plan which answers well, and by which good strong plants are procured in one month from the present year's runners. The compost he uses is good strong loam, well mixed with rotten dung from the hot-bed lining; 24-sized pots are the best for Keen's seedlings, and 32's for Grove-end Scarlets. The latter variety answers for early forcing better than any other when strawberries are wanted by the end of March. Having filled the pots with the compost, they are removed at once to the strawberry quarters, and arranged on each side of the rows amongst the runners. The middle of July, when the plants are emitting roots, is the proper time to begin the operation of layering; having previously prepared a quantity of pegs, the runners that are rooted into the ground are carefully removed, and their roots inserted in the pots and pegged down. He puts three plants into the 24 pots, and one in the 32's; they immediately begin growing, being supported by the mother plant, and will only require occasional watering in dry weather. When the plants are well rooted, which is in about one month, he detaches them from the old plants, and they are removed to their winter quarters. Beds are prepared for them with a bottom of coal ashes, and they are plunged in old tan; each bed is surrounded with a stratum of coal ashes six inches wide, and as high as the top of the pots, which prevents worms from working amongst them. (*Gard. Chron.* 1841, 550.)

Mr. G. Young, gardener at Willen Hall, near East Barnet, says the proper time for laying down the runners is from the second week in July to the third week in August; the pots generally used are known as forty-eights; in potting, care is taken that the crock is laid in the proper place; one is quite sufficient; the pots are then filled with soil, consisting of stiff loam and dung; in so doing the soil cannot be made too firm, consequently the fist must be clenched and used to accomplish this; the pots are then carried and placed in their proper position (not plunged) round those plants that were forced in the early part of the preceding season and subsequently planted out; the best of the runners are carefully singled out, and one laid in the centre of each pot; before laying the *plant, a hole is* made in the surface of the soil about half an inch deep; in this hole the plant is placed, and a stone immediately placed over it, sufficiently large to keep it in its proper position, and prevent the wind from blowing it about; the stone is allowed to remain till the plants are properly rooted, and special care is taken that the plants are well supplied with rich water when they require it, and that all the tendrils are pinched off close home to the rim of the pot; when the plants are well rooted they are cut away and removed to a shady place for a week or ten days, and they are then fully exposed. It is important that the plants do not suffer for want of water. In this state they are to remain without shifting into larger pots; when the weather indicates sharp frost, they must be removed to their winter quarters—the floor of a late vinery is very suitable. On the preservation of the roots in a healthy state during the winter months depends a large share of the success of strawberry forcing. Whatever plan is adopted, it is of great importance to protect sufficiently from frost and heavy drenching rains. Have the pots well washed with a scrubbing brush. After the pots are dry they ought to be surfaced, and then gently watered with a fine rose to settle the fresh mould. It is essentially necessary to have the plants placed near to the glass. The house or pit should be kept about 40 degs. for the first three weeks, advancing onwards as the plants increase in growth: when in full flower e heat ought to be about 55 degs., observing to give on all favourable opportunities, more especially ıen in flower. After the fruit are set the pine-house ll suit them well : shelves attached to the rafters, th iron straps placed at about 20 inches from the ass, are a good arrangement. Watering is very aterial, and ought to be carefully attended to : soot-ater, after the fruit is set, is an excellent stimulant. *Gard. Journ.* 1845, 268—347.)

Mr. J. Elliot, of Norton Conyers, near Ripon, lopts a system of forcing culture differing chiefly om others in the copious employment of artificial ıanures, and, according to his statement, with very gnal success. His directions are these :—

In the beginning of July, or as soon as the plants ın be obtained from laterals or runners, place 3-inch ots filled with good strong loam under each plant, ith a stone upon the surface, for the double purpose f fixing the plant in the pot and of keeping the soil ıoist. In less than a fortnight the young plants will ave become sufficiently rooted to bear separation om the parent ; they are then finally shifted, plac-ıg each plant singly into an 8-inch pot filled with ıam and abounding in humus, and slightly mixed ith superphosphate of lime, and the plants are set ı a shaded situation. In a few days they will have ufficiently recovered the check, and will be able to ar full exposure to the light and air, which is essentially necessary at this stage of their growth; give them copious waterings, when required, with a weak solution of ammonia (hartshorn) and sulphuric acid. Before winter they are plunged in a dry border, and are slightly covered with litter, if the frost is severe, for the sake of preserving the roots and pots. They are started towards spring by giving them a top-dressing of loam and superphosphate, which they like, sprinkling on the surface a little charcoal; they are then placed in a peach-house, on shelves, near the light, where they have the same temperature as the peaches, viz., 50 degs. by night, and never exceeding 75 degs. by day; keep up a humid atmosphere, watering the plants frequently with weak solutions of ammonia and sulphuric acid. As soon as the fruit becomes so large that the stem is not able to bear it, it is propped up or tied to sticks. By attending to these things, from 40 to 50 full-grown and average-sized fruit are obtained from each plant. (*Gard. Chron.* 1845, 362.)

DISEASE.

The only disease of the strawberry with which we are acquainted is *sterility* or *blindness*. In a very fertile soil, if the newly-inserted plants have their runners removed as soon as produced, they are very liable to be rendered over-luxuriant, and to be either entirely unproductive of blossom, or to have a few flowers, and these quite unproductive. If the leaves of these over-luxuriant plants be cut down close to the soil in the summer, and the runners are allowed to grow unchecked next year, we have found the fertility of the plants will be restored.

Strawberries, when forced, are also very liable to be blind, and this may arise from various causes. It may be occasioned by too much heat, with too little air and light; of the two latter they cannot have too much; and with regard to the former, the weather of a favourable month of May out of doors is a good criterion of the temperature they like. Blindness, however, very often happens in consequence of the plants having been exposed to excessive cold before being forced.

INSECTS, &c.

We agree with some of our best entomologists in considering the strawberry almost exempt from insect injury, but it is not entirely so. In the very ripe berries of the Chili strawberry, we remember to have found frequently a considerable number of small yellowish-white worms, or centipedes; we cannot exactly remember *which, for* it is many years since. At all *events their ravages* are very limited.

A small reddish mite (*Gamasus Baccarum*), having two black dots on the anterior part of its back, and moving with such velocity as to appear to fly, is also found upon the strawberry. We are not aware that it injures either the fruit or plant.

We have also observed in hollows scooped out of this fruit a small black beetle or weevil. It has not appeared to be very active, and therefore we cannot form an opinion as to whether it is identical with a jumping weevil (*Orchestes Fragariæ*), said by Fabricius to inhabit this plant; but as the same species is abundant in this country upon the beech, the beauty of which it materially injures by the numberless holes which it pierces in the leaves, and has never been taken upon the strawberry, it seems probable the Smidt's specimens might have fallen upon the latter from that tree. The only insect Mr. Kirby observed feeding upon this fruit is the ant, and the injury that it does is not material. (*Kirby and Spence's Entomology*, i. 195.)

The Slug and *the Snail*, if abundant in a garden, are the worst enemies of the strawberry, for they eat out the interior of the fruit, leaving nothing but its cuticle and the seed. Lime and salt applied at such seasons as not to be detrimental to the crop are the applications most fatal to these marauders, but their attacks may be checked by frequently hoeing the surface of the soil in the vicinity of the plants.

Where spent hops can be procured, a still more effecual obstacle is to cover the ground between the rows ith these; they will keep the fruit clean, and they anish the snails and slugs, especially in dry weather, or by adhering to their slimy skins, they make them eel uncomfortable, and consequently they change heir quarters. Where spent hops can not be procured, the best substitute is wheat straw cut small. (*Gard. Journ.* 1846, 329.)

The chief insects to which forced strawberries are subject are the Red Spider (*Acarus Tellarius*), and the green fly, especially the former, which must be carefully watched. If the syringe is duly employed every evening, it will not only keep the plants in a healthy state but also keep the insect from making progress. Where this practice is neglected it will be running great risk of losing the whole crop before they are ripe, as the increase of the insect is so rapid, especially where the forcing is carried on on shelves in pine stoves, that a few days' neglect will suffice to produce most disastrous effects.

The *Green Fly* (*Aphis*), although not so destructive as the former, will, if neglected, do considerable injury, and, therefore, whenever it begins to show itself on the plants the houses should immediately be filled with tobacco smoke, which will speedily destroy it.

Where too dry an atmosphere has been kept up, *the thrips* will be found to injure the plants considerably: the chief if not the only remedy for this pest, is a steady moist atmosphere, as no other application that we are aware of, has ever been found to keep this insect within bounds.

Mice cut off strawberries, while green, close to the calyx, and afterwards devour a great portion of their seed. As a remedy employ kitchen droppings mixed with arsenic; spread this on thin slices of bread, cut in small pieces; late in the evening lay it round the beds, and on the following morning pick up what is not used. (*Gard. Chron.* 1844, 541.)

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BIBLIOTHECA·BODLEIANA

THE

GARDENER'S

MONTHLY VOLUME.

THE DAHLIA;

ITS CULTURE, USES, AND HISTORY.

BY GEORGE W. JOHNSON,
Author of "The Dictionary of Modern Gardening," "Gardener's Almanack," &c.; and

J. TURNER,
Florist, Chalvey, near Windsor.

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THE DAHLIA.

HISTORY.

This most beautiful of our autumn border flowers being a native of the New World was totally unknown to the ancients; indeed it was not recognized by botanists before the close of the last century, nor was it introduced to our gardeners until about forty years ago.

The first discovered species of the genus is that known now to botanists as *Dahlia superflua*, or *D. variabilis*. It was found in 1789, and named by Cavanilles, a Spanish botanist, in honour of Dahl, a Swedish pupil of Linnæus, and a cultivator of the same sciences. Some objections have been raised to the name of Dahlia on the ground that it too nearly resembles that before given to a very different genus, Dalea; but this objection is not sufficient to counterpoise the greater inconveniences attendant upon a change of names. Willdenow, in 1803, gave it the names of *Georgina pinnata*, but though these were adopted also by M. De Candolle and a few other distinguished botanists, the prior applied names have prevailed, and, according to established custom, have been generally retained.

The plants from which three supposed species of this genus were described, were sent from the Botanic Garden at Mexico to the Royal Garden at Madrid, in which the one, called by Professor Cavanille, *Dahlia Pinnata*, flowered in October, 1789; his *D. Rosea* and *D. Coccinea* produced flowers a few years afterwards, and all were successfully figured and described by him in his "Icones;"—the first in 1791, the two last in 1794; they do not seem, however, to have been successfully treated, for with him they attained the height of three or four feet only, and did not flower till October. In 1802, plants of each were transferred from Madrid to the Jardin des Plantes at Paris, where they grew so well as to enable Mons. Thouin, in 1804, not only to describe and figure them, but also to treat on their cultivation. In May, 1804, seeds of the three kinds were sent from Madrid, by Lady Holland, to Mr. Buonainti, Lord Holland's librarian in England; from these good plants were produced, one of which, the *D. Pinnata*, flowered in September following, and was figured by Andrews, in the "Botanist's Repository." In the succeeding year, plants of the *D. Rosea* and the *D. Coccinea* also flowered in the gardens of Holland House.

Though this importation of the seeds was the most successful as to its produce (for from it nearly all the plants then in our gardens were obtained,) yet the original introduction of the first species was (on the authority of the *Hortus Kewensis*) from Spain, in 1789, by the Marchioness of Bute; but it is probable that the plant so introduced was soon after lost, as we do not find any further notice taken of it. The other species, then called Coccinea, was actually flowered by Mr. John Frazer, who is said to have obtained it from France in 1802, the same year in which it was produced in the French gardens from seed procured from Madrid. It also appears, that in the autumn of 1803, Mr. Woodford flowered, at Vauxhall, a plant of Cavanille's *D. Rosea,* which he had obtained from Paris; so that, independently of one introduced by the Marchioness of Bute, in 1789, it seems that both species had flowered in this country before the seeds were transmitted by Lady Holland.

At Madrid they were a long time in the Royal Garden without any indications of change; and it will be seen that after they were spread through Europe, some years elapsed before any extensive increase of variation took place.

Mons. De Candolle, it is said, obtained from Madrid the plants which he cultivated at Montpelier, about the same time they were sent to Paris. His *Memoir was printed* in 1810, and he therein describes

three varieties of *D. Frustranea ;*
Crocea, and *Flava.* Probably, when
had not obtained any double flowers,
dently expected such would soon be pr

Mons. Otto, as early as 1800, obtai
den, for the Royal Garden at Berlin,
D. Pallida of the "Hortus Beroline
1802, a plant of the *D. purpurea,* of t
was sent to him from Madrid; but h
varieties from his own seed till 1806.

The first introduction of the dahlia
Gardens at Berlin has been already not
occurred between 1800 and 1805. M
formed Mr. Sabine that the chief variet
between 1809 and 1817, but that t
shewed themselves were produced in 1
About 1813 he began to pay more p

to him in 1809, and in 1810 he raised another white one himself. He mentions that in the Catalogues of the Nurseries at Berlin, from 80 to 100 sorts are enumerated for sale, but he considers the really good ones to be about thirty.

In our own country we had an early promise of great success, and had we hit upon the right plan of management, in keeping the plants when produced, there is no doubt but we should have been as equally successful as the continental gardeners in obtaining varieties. Mr. Buonainti saved seeds from the plants raised at Holland House, in 1804, the produce of which seeds he states to have given him, in the succeeding year, nine varieties of that which was called *D. Pinnata*, two of which were double, one with lilac and the other with dark purple flowers; of the single flowered plants, some were certainly dark coloured, four figures were published from them at the time; the paler coloured varieties were chiefly considered as belonging to what was then called *D. Rosea;* he had also two varieties of *D. Coccinea*, the original deep coloured one and a paler one, which, though called by him Crocata, was the pale yellow variety, as is apparent from the figure of it, published in the "Paradisus Londinensis."

Mr. Salisbury also obtained several varieties from the seeds which he received from Holland House in *1806; these* he had particularly noticed in his paper printed in the first volume of the Transactions of the Horticultural Society. In the fifth volume of the second edition of the *Hortus Kewensis*, which was published in 1813, the varieties of *D. superflua*, there named, are Purpurea, Lilacina, and Nana; the latter being taken from a double variety, figured in Andrews' "Botanical Repository," but which is certainly not particularly entitled to be considered as a dwarf plant. No varieties of *D. frustranea* are given in the *Hortus Kewensis*.

Mons. de Candolle, in his essay on the genus, has observed, that it is not probable we shall ever see a blue one, since the variation is from purple to yellow. He considers blue and yellow to be the fundamental types of the colours of flowers, and that they mutually exclude each other: yellows pass readily into red or white, but never into blue: and in like manner, blue flowers are changed by cultivation into red and white, but never into yellow. (*Hort. Trans.* i. & iii., *Gard. and Flor.* ii. 66.)

Until about forty years ago, no variety was known that did not possess a tinge of purple in its blossoms, and it was even doubted whether a blossom entirely untinged with purple could be produced. (*Hort. Soc. Trans.* vii.)

When Mr. Sabine wrote on the dahlia in 1818, the single varieties only were abundant; the number of double ones was very limited, but they rapidly i creased, and have now nearly expelled the single ones from gardens of repute. The extension of sorts has, however, been limited to the *Dahlia superflua;* the varieties of *D. frustranea* have but little multiplied, and no double flowers of that species have yet been produced. The brilliancy of the colours of the blossoms of the *D. frustranea,* however, is such, that it might have been expected it would have induced some practical horticulturist to apply his skill to their improvement.

A few of the double dahlias which were raised at an early period still hold a place in the estimation of gardeners, but in general those of a few years' standing have yielded their places to a younger progeny, which in their turn may be deprived of their station by fresh productions. (*Hort. Soc. Trans.* vii. 141.)

After 1814, the dahlia was introduced to more general notice, and cultivated in most collections; but it was reserved for the intelligent cultivators of the last few years to circulate it more extensively, and make the most rapid advances towards a state of perfection. Indeed, so lately as less than twenty years since it was considered a perfectly novel sight to witness dahlias with double flowers in the garden of a tradesman or cottager; but, owing to the astonishing rapidity with which new and good sorts have since been obtained and circulated, it is now quite as rarely *that we see or* meet with a cottager's garden which does not contain at least a few good dahlias, and many possess plants of first-rate sorts. (*Paxton on the Dahlia*, 9.)

In taking a retrospective view of the dahlia fancy, it is pleasing to remark the gradual improvement of this autumnal favourite up to the present time. This improvement is annually progressing towards greater perfection; for, of late years, many of the finest varieties have been introduced; and it is notorious that an established fine seedling, at the present time, will command a higher price than at any previous period. To mark the progress of the dahlia, the stand that obtained the £20 prize for the best twenty-four blooms at the Cambridge Dahlia Show in 1840, contained only one variety that was shown in the first stand of the same number of blooms at the Metropolitan Exhibition of 1846, a brief period of six years. That variety was Springfield Rival, a flower of 13 or 14 years' standing. Both stands were grown by Mr. Turner. The former was considered to be the best that has been produced up to that time, and the latter was certainly the best twenty-four he had shown during 1846. At Cambridge, Unique was what is termed the "bloom of the exhibition;" Penelope, Amato, Hope, Conservative, Maid of Bath, and many other flowers now out of date, were stars in that superior stand.

The publications which have hitherto appeared on the dahlia are the following:—Cavanille's "Icones Plantarum qua &c., in Hortis (Hispania) hospitantur," printed at Madrid in 1791, and subsequent years. "Memoire sur la cellure des Dahlias, &c. par Mons. Thouin," in the third volume of the *Annales da Museum*, published at Paris in 1804. A communication from Mr. Buonainti, librarian to Lord Holland, on the dahlia, printed at the end of Macdonald's "Gardener's Dictionary;" this appears to have been written about July 1806. "Observations on the different species of Dahlia, &c.," by Mr. Salisbury, read April, 1808, before the Horticultural Society. "Observations on the Culture of the Dahlia in the northern parts of Great Britain," by Mr. Wedgewood, read before the Horticulral Society in November, 1808, and published, together with the preceding, in the first volume of the Society's Transactions. The dahlias are described and noticed by Professor Willdenow, of Berlin, in his "Enumeratio Plantarum Horti Regis Botanici Berolinensis," printed at Berlin, in 1809, and in this he refers to the plates and descriptions of the Hortis Berolinensis, in which they had been figured a short time before; and to his edition of the Species Plantarum of Linnæus. "Note sur la Georgina (dahlia)," by Mons. De Candolle, in the 15th volume of the *Annales de la Museum*, printed in 1810. Instructions for the cultivation of the dahlias in France, are given by Mons. Dumont de Courset, in *Le Botaniste Cultivateur*.

In 1812, at Paris, M. A. Thiebant de Berneaud, published "Memoire sur la culture des dahlies, &c;" and in similar floricultural works, Mr. Hogg, Mr. Maddock, and others have written, in this country, upon dahlia culture.

Figures of different varieties of the dahlia, with some observations on each, have, at various times, been published it the Paradisus Londinensis, the the Botanist's Repository, the Botanical Magazine, the Botanical Register, and other periodicals devoted to flowers.

An expensive work, entitled "The Dahlia Register," intended to have been continued annually, was published in 1836. It contained 53 coloured plates of the best varieties then known. No other volume was published. In 1840, Mr. Paxton published "A Practical Treatise on the Cultivation of the Dahlia;" and Mr. Turner, in 1846, gave to the public his "Practical Observations on the Culture of the Dahlia."

From all of the foregoing, we have culled the most useful information; and this amalgamated with, and corrected by, our own later experience, will render, we believe, this volume, the most useful and comprehensive authority on the culture of the dahlia that has hitherto appeared.

BOTANICAL CHARACTER.

The **Dahlia superflua**, parent of all the beautiful double varieties of our gardens, like the other species of the genus, is a native of Mexico. It was first discovered there by Baron Humboldt, growing in the sandy meadows of its mountain districts, at an elevation of between four and five thousand feet above the sea. Humboldt sent it to the Botanical Gardens at Mexico, and thence, as we have already stated, it was transmitted to Madrid.

The genus dahlia is included in the Syngenesia superflua Class and Order of the Linnæan System; and in the Compositæ of the Natural arrangement. Its characteristics are as follow.

Common Calyx double; the outer of several leaves, 6 or 7, ovato-spatulate, reflexed; inner of one leaf, cup-shaped, in several ovate segments. *Corolla*, compound, radiant; florets of the centre perfect, with a tubular, stalked, five-cleft petal; those of the radius fertile, with an ovate three-toothed petal, equal in number to the segments of the calyx. *Stamens* (in the perfect florets) filaments five, broadest at the base, inserted into the bottom of the petal; anthers united into a tube. *Pistil:* Germen somewhat *spatulate*, *obscurely* triangular, notched at the top;

style thread-shaped; stigmas somewhat spreading, pubescent. *Seeds* solitary, shaped like the germen. *Receptacle* flat, chaffy; the scales large, the middle ones keeled, the rest flat. Down none.

Although the stems are too tender to endure the low temperatures of our winters, yet they are not strictly annual, for, we find that, in the mild climate of Devonshire, Mr. Murray, gardener at Taymouth Castle, had in the gardens there early in July, 1845, two dahlias, (Phenomenon and Andrew Hofer,) in full bloom, after having withstood the winter's cold, in the open air, preserving their previous year's stems and foliage. (*Gard. Chron.* 1845, 562.)

VARIETIES.

Every autumn of the last thirty years has added to numbers of our superior varieties, so that now they amount to many hundreds, and each characterised by some peculiarity of size, habit, form, and colour. It is satisfactory to the physiological botanist to find that, notwithstanding the great diversity of colour thus exhibited, still the conclusion arrived at by M. De Candolle remains intact. We have seen, as stated in a previous page, that he concluded upon scientific data that a blue dahlia would not be produced by the florist, and certainly no such colour has yet been found in the petals of the thousands of seedlings annually bloomed.

We subjoin a list of dahlias, both show flowers, and those known as fancy varieties, which are the best out up to the present time, both for showing, and the flower border. An asterisk denotes those with long stout footstalks, which, with the fancy kinds, are best adapted for grouping and bedding out.

Fancy Varieties.—There is still much difference of opinion respecting what really are fancy varieties, for we find flowers in some catalogues of fancy dahlias, which in others are described amongst the ordinary varieties. Our definition is that, all varieties with two or more colours may be termed fancy dahlias; especially if the edges or tips are of a colour lighter than that of the chief surfaces of the petals. To be a valuable flower in this class, there should be great contrast, with an equal distribution of colour, whether it be tipped, striped, margined, or spotted.

It will be useful to note the following definitions usually employed in describing dahlias.

The appellation of *florets* should be applied in all cases to what have been improperly called the petals; they are strictly, and especially in single flowers, the *florets of the ray;* when there is an allusion to the short florets in the disk of the flowers, they are distinctly the florets of the disc. The term *quilled*, *in its strict sense,* is applied to ligulate florets become tubular, but it is generally used to express a tendency only to that habit. In the descriptions, for the sake of discriminating the differences with greater accuracy, the terms *quilled* and *half-quilled*, are used; but for the latter term, *somewhat quilled* is not unfrequently substituted. The florets are said to be *reflexed*, when the whole are bent backwards, exposing the disc. They are *recurved*, when they are turned backwards at the points. The *scales* are the bracteæ of the involucrum, and in single flowers are situated behind the florets of the ray, one scale belonging to each floret; when the florets of the disc give way to, or are changed into, florets resembling those of the ray, the scale accompanies the transmutation, so that in double flowers a series of scales is found behind every series of florets, and when these scales appear in the centre or disc, without being accompanied by ligulate florets, it is known, that although by some abortion they have not been produced, yet that whenever the plant blossoms perfectly, the flowers will be entirely double, that is, devoid of disc. These scales cannot be confounded with the small scales or paleæ of the receptacle, the former being much larger, and generally dark green. (*Hort. Soc. Trans.* vii. 144.)

WHITE.

**Antagonist* (Bragg), 1843, height 4 ft.
Empress of Whites (Heale), 1845, 2 ft.
Princess Helena (Gaines), 1847, 3 to 4 ft.
**Queen of Sheba* (Watkinson), 1847, 4 ft.
Schneerose von Esterthab (Deegen), 1846, 4 ft.

WHITE; TIPPED, EDGED, AND SHADED WITH CRIMSON.

Beauty of Sussex (Mitchell), 1843, 3 ft.
Delicata (Turner), 1847, 4 ft.
**Emily* (Dosset), 1847, 4 to 5 ft.
Marquis of Worcester (Sealey), 1847, 4 ft.
**Northern Beauty* (Robinson), 1842, 6 ft.
Princess Radziwell (Gaines), 1846, 3 to 4 ft.
Sarah (Drummond), 1846, 3 to 4 ft.
Star (Bragg), 1847.

WHITE; TIPPED OR EDGED WITH PURPLE OR LILAC.

Alice Hawthorn (Sainsbury), 1845, 4 ft.
Beauty of the Plain (Spary), 1840, 3 ft.
**Lady St. Maur* (Brown), 1844, 4 ft.
**Lady of the Lake* (Keynes), 1847, 4 ft.
**Lady Featherstone* (Spary), 1846, 4 to 5 ft.

Marguarita (Paris), 1847, 4 ft.
Metropolitan Queen (Jullien), 1847, 4 ft.
**Miss Vyse* (Turner), 1847, 3 ft.

YELLOW.

**Cleopatra* (Attwell), 1845, 6 ft.
Goldfinder (Bushell), 1847, 4 ft.
Yellow Standard (Keynes), 1847, 3 to 4 ft.

ORANGE AND BUFF.

Aurantia (Spary), 1844, 3 to 4 ft.
**Bertha Von Gena* (Koek), 1846, 4 ft.
**Biondetta* (Paragot), 1845, 6 ft.
**Countess of Brandon* (Spary), 1846, 5 ft.
Gloria Mundi (Headley), 1845, 5 ft.
Golden Fleece (Pearce), 1847, 4 ft.
Lady Leicester (Girling), 1845, 5 ft.
Princess de Joinville (Fourquet), 1846, 3 ft.

LILAC.

**Athelete*, 1844, 4 to 5 ft.
Chef d'Ouvre (Dubras), 1846, 4 ft.
Dasinski, 1846, 4 ft.
**Mrs. Anderson* (Girling), 1846, 5 ft.
Queen of Perpetuals (Girling), 1846, 2 to 3 ft.
**Victorine* (Bushell), 1847, 4 ft.

PURPLE.

**Bermondsey Bee* (Prockter), 1844, 4 ft.
**Candidate* (Silverlock), 1842, 6 ft.
**Floribunda* (Pearce), 1846, 6 ft.
**Pickwick* (Cormack), 1840, 4 ft.
**Prometheus* (Wildman), 1846, 6 ft.

PEACH LILAC.

Dawn of Day (Mitchell), 1846, 3 ft.
Rose d'Amour (Brown), 1846, 4 ft.

DARK SHADED.

Raphael (Brown), 1844, 4 ft.
**Vanguard* (Turner), 1846, 3 to 4 ft.

SCARLET AND ORANGE SCARLET.

**Baron Von Rothschild* (Werker), 4 ft.
Duchess de Montpensier, 1846, 4 ft.
Nonpareil (Prockter), 1844, 4 ft.
Scarlet Gem (Turner), 1847, 4 ft.

CRIMSON AND ROSY CRIMSON.

**Beeswing* (Sainsbury), 1845, 4 ft.
**Capt. Warner* (Girling), 1846, 3 to 4 ft.
Caractacus (Sorrell), 1846, 4 ft.
**Cassandra* (Fellows), 1847, 6 ft.

Dr. Graham (Girling), 1846, 4 ft.
**Erectum* (Mitchell), 1846, 4 ft.
Lord St. Maur (Wheeler), 1847, 4 ft.
**Louis Philippe* (Turner), 1847, 5 ft.
**Perpetual Grand* (Brown), 1843, 5 ft.
**President of the West* (Whale), 1840, 5 to 6 ft.
**Sir E. Antrobus* (Keynes), 1846, 5 ft.
**Springfield Rival* (Inwood), 1833, 5 to 6 ft.
**Standard of Perfection* (Keynes), 1844, 4 ft.
**Victory of Sussex* (Stanford), 1843, 6 ft.

DARK CRIMSON AND MAROON.

**Admiral Stopford* (Trenfield), 1842, 5 ft.
Berryer (Turner), 1847, 4 ft.*
**Essex Triumph* (Turrille), 1843, 4 ft.
**Octavian* (Pearce), 1846, 4 ft.
**Queen of Gipsies* (Girling), 1844, 5 ft.

ROSE.

Adonis (Dubras), 1847, 4 ft.
Competitor (Hodges), 1841, 3 ft.
Dowager Lady Cooper (Jackson), 1842, 4 ft.
**Duchess of Richmond* (Fowler), 1839, 5 ft.
Exemia (Girling), 1843, 3 to 4 ft.
Felix (Drummond), 1847, 4 ft.

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* This is the darkest variety known, and a valuable acquisition.—G. W. J.

**Lady Stopford* (Trenfield), 1846, 5 ft.
Queen (Widnall), 1841, 4 ft.
Queen of Roses (Widnall), 1844, 3 ft.
Rosetta (Girling), 1847, 4 ft.
Sir J. S. Richardson (Sharp), 1844, 4 ft.

ROSY PURPLE OR LILAC.

Essex Rosy Lilac (Turville), 1846, 3 ft.
Fulwood Hero (Teebay), 1845, 4 ft.
**Indispensable* (Girling), 1841, 5 ft.
Marquis of Aylesbury (Spary), 1846, 3 ft.
Mrs. Shelly (Mitchell), 1843, 4 ft.

BLUSH.

Beauty of Hants (Oakley), 1846, 4 ft.
**Marchioness of Cornwallis* (Whale), 1846, 3 to 4 ft.
Miss Sarah (Edwards), 1846, 4 ft.

BUFF, TIPPED OR EDGED.

Andromeda (Collison), 1847, 5 ft.
Melanie Adam, 4 ft.
Princess Royal (Hudson), 1842, 5 ft.

YELLOW-EDGED OR TIPPED WITH RED.

**Aurora* (Hale), 1847, 4 ft.
Lady Sale (Smith), 1845, 3 to 4 ft,
**Madame Zehler* (Zehler), 1846, 4 ft.
Serviteur de Madame Zehler (Zehler), 1847, 4 ft.

FANCY DAHLIAS.

CRIMSON, WITH WHITE TIPS OR STRIPED.

Erecta (Girling), 4 ft.
Hector (Freulle), 4 ft.
Hermione (Mohring), 4 ft.
Ludwig Marquard (Sieckman), 3 ft.
Prima Donna (Spary), 3 to 4 ft.
Quinola (Poulet), 3 ft.

RED, WITH WHITE TIPS OR STRIPES.

Admirable (Girling), 3 ft.
Baron Hugel, 4 to 5 ft.
Boquet de Bruiel, 3 to 4 ft.
Harlequin (Dodd), 4 ft.
Ludwig Pemsl (Deegen), 4 ft.
Nihil (Baillie), 5 ft.
Schone Von Zerbst (Hoffman), 4 ft.
Stern Von Zerbst (Hoffman), 3 to 4 ft.

PURPLE, TIPPED OR STRIPED WITH WHITE.

Erzherzog Stephan (Deegen), 4 ft.
Eugene Sue (Mea), 3 to 4 ft.
Eveque de Dijon (Paulet), 4 ft.
Giselle (Truelle), 3 ft.
Madame Wachy (Wachy), 4 ft.

Master Edward Clayton (Jeffrey), 4 to 5 ft.
Master George Clayton (Jeffrey), 4 ft.
Miss Watson (Girling), 4 ft.
Pantaloon (Bragg), 4 to 5 ft.
Souvenir (Girling), 4 ft.
Sully (Cressac), 3 to 4 ft.
Surprise (Oakley), 3 to 4 ft.

YELLOW, TIPPED WHITE.

Adolph Dubras (Vicomte de Ressequier), 4 ft.
Mimosa (Truelle), 2 to 3 ft.
Queen of the French (Burgess), 4 ft.
Thomirin, 4 ft.

MAROON, WHITE TIPS.

Madame Wallner (Girling), 4 to 5 ft.
Ober Justizrath von Werthoff (Miller), 4 ft.
Roi des Points (Batteur), 4 to 5 ft.

ROSE, ROSY LILAC, AND WHITE.

Bijou (Vicomte de Ressequier), 4 ft.
Bijou de Closhault, 4 ft.
Bijou de Dijon, 3 to 4 ft.
Madame Chauviere (Girling), 4 to 5 ft.
Madame Dresser (Deegen), 3 ft.
Miss Maria Clayton (Jeffrey), 4 ft.

CARMINE AND WHITE.

Coquette (Schmidt), 5 ft.
Fra Diavolo (Girardoni), 4 ft.
Triumph von Magdeburg (Ehrig), 4 ft.

BUFF OR SALMON, TIPPED.

Captivation (Salter), 3 to 4 ft.

VARIOUS—STRIPED, SPOTTED, ETC.

Alexander Schultz (Deegen), 4 ft.
Goldfinch (Turrelle), 4 ft.
La Carnation (Girling), 3 ft.
Mirocolant (De Knuff), 3 ft.
Multicolor Admirabilis (Mardner), 3 to 4 ft.
Triumph Von Anhalt (Hoffman), 4 ft.
Zebra, Yeeles, 4 to 5 ft.

CHEMICAL COMPOSITION.

We have no entire analysis of any part of the dahlia, but chemists have ascertained that its tubers contain a large proportion of a peculiar feculous substance, to which the name of *Dahline* or *Inuline* has been given. It chiefly differs from starch in one property, viz., that the latter is rendered blue when treated with iodine, whereas iodine imparts to dahline a yellow colour.

Dahline is found in the roots of many other plants, such as those of the Jerusalem Artichoke (*Helianthus tuberosus*), Pellitory of Spain (*Anthemis pyrethrum*), Meadow Saffron (*Colchicum autumnale*), Succory (*Cichorium intybus*), Dandelion (*Leontodon taraxacum*), Angelica (*Angelica archangelica*), Elecampane (*Corvisartia (Inula) helenium*), and *Datisca cannabina.*[*]

When the roots of any of the above plants are rasped, subjected to pressure, boiled in water, the infusion filtered through linen while hot, boiled until a pellicle forms on the surface, and then left to cool, a white powder precipitates. This is dahline, and only requires to be collected on a filter, well washed and dried. One hundred parts of the roots of the dahlia yield 10, of inula 11, 1, of leontodon 12, and of cichorium 12¼ of dahline. (*Raspail's Organic Chemistry*, 137.)

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[*] Chemists, considering that they had discovered in each case a new principle, have called dalhine by other names, as *Inuline*, or *Helenine*, when found in Inula helenium; *Alantine*, when from the Angelica; and *Datiscine*, when from the Datisca.

CHARACTERISTICS OF EXCELLENCE.

We know of no flower more totally altered by cultivation than the dahlia, and not any one only acquainted with that flower in its natural form, reading the characteristics we shall presently record as requisite to be combined for entitling a variety to be classed among first-rate flowers, could conceive that they are applicable to its progeny.

Before proceeding to the detail of those desired characteristics, we must place before our readers some most excellent warnings against the hasty condemnation of a variety that may seem not to be permanent in its excellencies.

The dahlia, it is truly said, is subject to vary so much in different situations and seasons, that great difficulty exists in gaining an accurate knowledge of the merits of each kind, especially of those which have been only seen for one season. The circumstances under which it is grown are also so various, that unless you see the plant, you cannot fairly judge of the merits of the flower. Great attention is requisite, in order, if possible, to find out what particular culture a given plant has been subjected to; for example, whether the shoots have been much thinned, the flowers shaded, much manure given, or none at all, &c.

The following facts with regard to new kinds of dahlias should always be borne in mind before condemning them the second year:—

1. That the seedling plant is much debilitated by propagation, and therefore the flowers are rarely as good the second season as they are the first and third.

2. That the best flowers are obtained from those plants struck from the first cuttings produced by the mother plant, notwithstanding that they are seldom as strong as the cuttings that are afterwards produced.

3. That exciting the roots by means of a strong heat early in the spring, and striking the young plants on a strong dung bed, tend to weaken the plants so treated to such a degree, that they frequently require two or three seasons to recover, and regain their original character. Thus, it is found that good flowers are obtained with the least trouble from those plants kept in pots the first season after striking (termed by the trade pot-roots); planted out the following season, and allowed to start of their own accord.

4. That in wet seasons manure is frequently very

injurious, from its causing the plant to grow luxuriantly, and thus to produce but few flowers; while in very dry seasons, it is equally beneficial. Much more depends on a change of soil, than on its composition and quality.

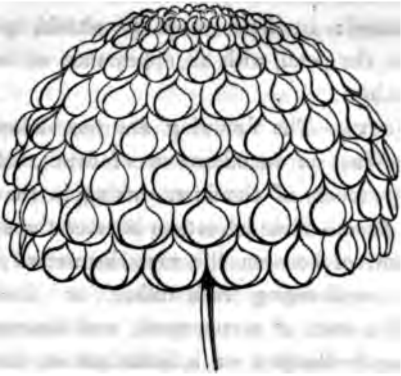
5. That water is a point which cannot be too much attended to; a great difference is caused in the same flower by hard and soft water; but still more depends on the manner in which it is applied, for one or two good waterings are much better than a small quantity given three or four times a week.

6. That taking up the roots immediately after a frost has destroyed the top, is the principal cause of so many roots dying during the winter season. *(Gard. Chron.* 1841, 19.*)*

The most just codes of excellence relative to the dahlia have been promulgated by Mr. Wildman and Mr. Glenny, agreeing on the principal points, but each so supplying deficiencies occurring in the other, as to induce us to republish both.

The first is the code of Mr. Wildman, communicated by him to the London Floricultural Society, and approved by that association.

I. Form.—The outline, in profile, should be that of about two-thirds of a globe or sphere, and as shewn in this engraving, the rows of florets forming this globular outline should describe unbroken con-



centric circles lying above each other with evenness and regularity, and gradually diminishing till they approach the crown. The florets forming these rows should be spirally arranged, and alternate, like the scales of a fir cone; those in each superior row concealing the joints in the row beneath, and causing the circle to be unbroken and complete. They should be broad at the ends, perfectly free from notch or indentation of any kind, firm in substance, smooth in texture, uniform in size, and evenly and freely expanded in each row, but largest in the outer ones, gradually and proportionably diminishing until they approach the crown, where they should gently turn the reverse way, pointing inwards, and forming a neat and close *centre.*

II. Colour.—If in a self, it should be dense and clear; if in an edged flower, concentrated and well-defined: in both cases it should penetrate through the petal, with an appearance of substance and solidity.

Defects.—The following are the defects:—*In Form*—Want of roundness or of depth, flatness of face, squareness of shoulder, sinking in the centre. *In the Rows*—Wide interstices between the florets in each row, or between the rows themselves; broken circles, overhanging each other, or diminishing abruptly; want of arrangement, and looseness. *In the Floret*—Notches or indentations on the edge, sharp points, angularity, cupping too deeply with wide mouths; abrupt hollows in the face, or ribbiness; being too broad, coarse, or overwrapping each other sideways, or being too narrow and guttery, or not touching each other in the rows; quilling or curling, or shewing the back in any manner; curling too much upwards, turning quite back, or being upright in the centre; want of substance, and not concealing the scale. *In the Colour*—Cloudy, not mottled; thinly laid on in patches or in spots, or variable; not being the same at the back as on the face of the petal. *In Size*—Being below the average, or so large as to be coarse. *Disqualifications*—Shewing yellow disk or a hard and scaly centre, cross eye, petals damaged in any manner, blooms dead or decaying. The object ought to be to obtain freedom without looseness, boldness without coarseness, and symmetry and uniformity without stiffness or formality. (*Gard. Chron.* 1843, 87.)

Mr. Glenny's code of excellence is comprised in these requirements :—

1. FORM.—The flower should be a perfect circle when viewed in front; the petals should be broad at the ends, smooth at the edges, thick in substance, perfectly free from indenture or point, stiff to hold its form; should cup a little, but not enough to shew the under surface. They should be in regular rows, forming an outline of a perfect circle, without any vacancy between them; and all in the circle should be the same size, uniformly opened to the same shape, and not rubbed or crumpled.

2. The flower should form two-thirds of a ball when looked at sideways. The rows of petals should rise one above another in rows; every petal should cover the join of the two petals under it—what the florists call imbricating—by which means the circular appearance is perfected throughout.

3. The centre should be perfect; the unbloomed petals lying with their points towards the centre, should form a button, and should be the highest part of the flower completing the ball.

4. The flower should be symmetrical. The petals *should open boldly,* without showing their under-side,

even when half opened, and should form circular rows, uniformly laid, evenly opened, and enlarging by degrees to the outer row of all.

5. The flower should be very double. The rows of petals laying one above another, should cover one another very nearly; not more should be seen in depth than half the breadth; the more they are covered, so as to leave them distinct, the better in that respect; the petals, therefore, though cupped must be shallow.

6. Size.—The size of the flower when well grown should be less than four inches in diameter, and not more than six.

7. Colour.—The colour should be dense, whatever it be—not as if it were a white dipped in colour, but as if the whole flower was coloured throughout. Whether tipped or edged, it must be free from splashes or blotches, or indefinite marks of any kind; and new flowers, unless they beat all old ones of the same colour, or are of a novel colour themselves, with a majority of the points of excellence, should be rejected.

Defects.—If the petals show the under side too much, even when looked at sideways—if they do not cover each other well—if the centre is composed of petals pointing upwards, or those which are round the centre are confused—if the petals are too narrow, or exhibit too much of their length—or if they show any of the green scale at the bottoms of the petals—if the eye is sunk—if the shoulder is too high, the face flat, or the sides too upright—if the petals show an indenture as if heart-shaped—if the petals are too large and coarse, or are flimsy, or do not hold their form: in any or all these cases the flowers are objectionable; and if there be one or two of these faults conspicuous, the flower is second or third-rate.

If flowers are exhibited which shew the disc, or a green scale, or have been eaten by vermin, or damaged by carriage, or are evidently decayed, the censors should reject them at once.

Characteristics of the Plant.—Although the form of the plant is quite of secondary consideration, and is only to be regarded as subservient to the more important consideration of exhibiting the flowers to more advantage as they grow, yet it is a matter worthy of some notice. Mr. Paxton's observations upon it are very judicious. He says, the general figure should be uniform and compact, that is, it should gradually enlarge from the lowest lateral shoots to the extremity of those highest, and it should be devoid of a straggling or rambling habit. Secondly, the plant should be disposed to bloom freely and numerously. Thirdly, its blossoms should stand out clearly from the foliage, on short, strong flower-stalks, so as to be presented boldly and advantageously. *(Paxton on the Dahlia, 99.)*

OF STANDS OR COLLECTIONS.

Variety of colour forms a distinct excellence, and if disposed uniformly, it is another excellence; a third excellence is contrast. If light and dark flowers, and middling, were in a stand of twenty-four, there are several ways of being uniform: say L means light, D dark, M middling, the following would be instances of uniformity:—

L	D	M	L	L	M	D	L
M	L	D	M	M	D	L	M
D	M	L	D	D	L	M	D

L	M	D	L	L	D	M	L
D	L	M	D	D	M	L	D
L	M	D	L	L	D	M	L

(*Gard. and Flor.* i. 56.)

CUTTING BLOOMS TO SHOW.

For this purpose, it is necessary to look more to fine flowers than to new sorts. Look well to the properties of the flowers, and take those which approach the nearest to perfection in form, whether they be old or new. In making up a stand, contrast of colour should, however, be observed as much as possible, and they should be placed on the stand uniformly;

there should be colours of about the same depth at the four corners, and if these are light, those next to the corner ones should be dark; but there are several modes of doing them uniformly. The top and bottom row should be alike as to their colour. Suppose the stand to be twelve, they may be arranged either of the ways pointed out here, or any other way that preserves uniformity.

Light	Dark	Dark	Light
Dark	Middling	Middling	Dark
Light	Dark	Dark	Light

Dark	Middling	Middling	Dark
Light	Dark	Dark	Light
Dark	Light	Light	Dark

Half the stands are spoiled by putting too many dark purples in them; and although form ought to be the first consideration, contrast and order, or uniformity, adds greatly to the merit of a stand. (*Gard. and Flor.* ii. 30.)

Selecting the blooms for exhibition often puzzles the most experienced growers; the dark selfs being so much more numerous and superior in shape to the light flowers; that, in selecting twenty-four, one or two points often have to be sacrificed—either shape, or contrast in colours. We recommend that as much *diversity of colour* should be introduced as possible, with due regard to shape and perfect centres. Much can be done by arrangement; yet we often see stands contain a whole row of flowers of great similarity. At all times place deep circular flowers at the four corners; and select quality before size. If a bloom is observed to be shaky behind, or inclined to open in the centre, when packing up your box, it may safely be concluded that it will not make one of the number required, by the time it is wanted. Discard it at once, and look for the next best of the same sort.

If the blooms are intended to travel a long distance, provide plenty of young ones in addition.

Never, unnecessarily, handle the blooms. It should be remembered that all this pains-taking has been to produce them in the highest state of perfection, to be looked at only. The dead appearance caused by rough usage can never be removed. (*Turner on the Dahlia*, 6.)

Mr. Glenny, whose opinions on all points connected with floriculture merit attention, recommends (*Gard. Gaz.* 137) that for exhibition, dahlia blooms should be cut before too old; the boxes soaked in water for an hour or two before the blooms are packed in them; and when taken out, not to be touched, as there will be a brilliant fresh dew upon them. If the stoppers of the tubers be soaked at the same time, they swell all they can, and there is no doing so after they are in the tubes. If stoppers are absent, they may be made of potatoes; and the blooms should be so high above the tubes that the lower petals do not touch the board.

Exhibiting Stand.—Dr. Lindley says, the dimensions of a dahlia stand for twelve blooms should be twenty-two inches long by sixteen and a half wide, four in depth, and five and a quarter from tube to tube :- sixteen and a half by eleven and a quarter will be the proportion for a stand of six. The surface of stands is generally painted a light green; a colour which shows the flowers off to the greatest advantage. (*Gard. Chron.*)

For sending dahlias to a distance, a wooden funnel, not unlike a hyacinth glass in shape, has been invented by Mr. Pratt, head gardener to W. Harrison, Esq., Gothic Cottage, Cheshunt. The stalk of the dahlia is thrust down the tube of this funnel, whilst its blossom rests in, and is protected by, the basin of the funnel. Each dahlia bloom has its funnel, and the funnels are inserted in holes made at regular distances in a tin plate, which forms a cover to a shallow box containing moistened moss. So treated, dahlias will remain fresh for a week, and may be sent to any distance. (*Gard. Mag.* v. 526, N.S.)

MODES OF PROPAGATION.

LIKE other tuberous-rooted plants, the dahlia can be propagated in more modes than can other plants of a different form.

By Seed.—Varieties only can be obtained in this mode, for no seedling exactly resembles its parent; though cross-breeding—an intermixture of parents—has great influence in determining the properties or characteristics of the offspring.

Although the parentage has great influence, yet the influence is not paramount, for, as Mr. Wildman has justly observed, so much depends upon accident, or circumstances over which we have no control, that it is difficult to recommend one in particular as a desirable parent to breed from. The amateur should be warned, however, that seeds from thin flowers generally, although their style be good, produce seedlings that end in disappointment. Windsor Rival is an example. Constancy in the parent, Mr. Wildman thinks a matter of little moment, provided defective blooms are immediately removed, and none but the best left for seed. Brightness and clearness of colour are desirable, but no dependence can be placed upon the exact colours that will be produced. If hybridization is resorted to, the best blooms, whether occasional or otherwise, from which seed might be obtainable should be selected, the colours chosen being distinct and contrasted, and not compound. To those who would not take the trouble to resort to artificial fertilization, which is not needed if a few of the very best varieties, including one or two that seed most freely, should be planted together, apart from all others; the chances then would be far more in favour of valuable seedlings beings engendered.

In making a selection to seed from, the habit of the plant should not be overlooked, there being but little beauty in those flowering beneath the foliage, or of drooping habit, unless the latter are tall growers, such as the Countess of Liverpool. Substance of petal is perhaps the most important point; without this, the colour, or the bloom itself, stands but a very short time. Those varieties possessing this quality in the greatest degree have the most glossy or velvety appearance on the face of the petal. The following would be a good dozen to plant out for this purpose: Marchioness of Cornwallis, Berryer, Beauty of Sussex, Lady St. Maur, Nonpareil, Standard of Perfection, Scarlet Gem, Queen of Sheba, Master George Clayton, Yellow Standard, Princess Radziwill, and Beeswing. Even the finest, and what are termed the most constant flowers, produce blooms that should at once be removed: for this purpose the plants *should often be* examined, as it is impossible to distinguish the good from the bad when gathering the seed. And more, the thin blooms possess so much fertilizing matter, from which the bees would injure the whole.

For the production of seed the plants should be devoted to the purpose. All but a few of the uppermost shoots should be pruned away as they appear, and from these, the first flowers, which are rarely good, should be removed. Mr. Paxton adds, that about twenty or thirty flowers should be left, and of these only the finest and best formed be bred from. As soon as each reserved disk begins to expand, it should be covered with thin muslin or gauze to prevent any fecundation by the wind or by bees, from other and undesired varieties. As soon as the florets open, the pollen from the wished-for male parent may be introduced to them during two or three successive days, by the aid of a camel's-hair pencil; this operation to be repeated to each floret as it expands; and the flowers to be kept covered as before directed, until the danger of casual fertilization is passed.

In collecting the seeds, Mr. Paxton recommends that the outer circle of them, and those in the very centre of the disc, should be discarded, the first usually producing single flowers, and the others being imperfectly formed. (*Paxton on the Dahlia*, 68.)

Glory of Plymouth has, to the great astonishment of all who possessed the slightest knowledge of the parts of the flower, been repeatedly recommended as a good flower from which to save seed. Now, Glory of Plymouth is one of the most double flowers that has ever yet been raised, and, like Globe Crimson, full to the centre; and it might be asserted, without fear of contradiction, that it never has been seeded from, and that it is incapable of bearing seed. This is not a matter of opinion, but one of fact; and any misstatement can be easily disproved.

If *all* the imperfect blooms had been removed from Windsor Rival, not more than one pod of seed could have been obtained in a season.

We have already noticed which seed should be rejected; and we may now observe that, that which is to be preserved should be collected on a fine day, and, after drying thoroughly, be rubbed out from the heads, and kept dry until required for sowing. If kept in the heads they are liable to become mouldy.

The seed ought to be sown about the middle of March on a slight hotbed, to get the plants up early; and which, if properly attended to, will flower the same year; the young plants ought to be pricked out as soon as they are fit—three or four in a No. 48 pot; and as they advance in growth, they may be shifted a month after into small 60 pots, one in each pot; which, after it has grown in strength and size, may be shifted again into a 48, there to remain, till turned *into the ground* about the third week of May; in their young and tender state, take care to protect them from cold and frost, so that they receive no check either to retard or spoil their growth. (*Hogg's App*. 196.) Our own practice is to prick the seedlings, singly, into 48s, to remain until fit to be planted out in the open border.

Where seedlings are grown by the florist, it is, generally, in such numbers that protection at night is impossible. The fault of protection being required lies in almost every one sowing too early. It was usual at one time to sow about Christmas; we now sow the first of April, and bloom them a month sooner than formerly, with half the trouble. If planted early, the check is mostly from cutting, cold winds, throwing them back several weeks. Hence the principal object being to keep the plants dwarf.

Mr Sabine, late secretary to the Horticulture Society of London, has left on record suggestions for raising seedlings that are still worthy of attention. The seed, he says, should be gathered from those plants whose colours and character are most likely to please, always taking from the dwarfer ones, where no preference exists on other accounts. Many of the seedlings will follow their parent; therefore, all that are raised will now be new varieties. Double flowering plants are more likely to spring from the seeds of semi-double flowers, than from those of quite single ones; and the chances are, that seeds obtained from those particular florets of the disc, which have altered their form, may have a greater tendency than others to produce plants with double flowers.

The young plants, pricked out into pots or boxes, and left under cover in warmth until the end of April, may be planted out then where they are to remain, covering each plant for some time with an empty pot at night, to avoid injury from spring frosts. Where single dahlias have been planted the preceding year, many young plants will arise from self-sown seeds; these may remain in their original place, or be removed. The seedlings should be planted in rows three feet apart, and two feet distant from each other in the row; this will allow sufficient space for a person to walk between them to examine the different varieties. Every alternate row may be two feet, if space is an object, thus forming them into beds, leaving plenty of room to look over them twice a week to weed out the single flowers, thus giving sufficient space for the promising plants to bloom in character. They thrive best in rich loam, and require a clear open space to grow in, the shelter of trees or of walls being injurious to them. They seem to suffer in some gardens, if planted often in the same place; therefore, where there is not space to enable the grower to move their quarters in successive years, it will be advisable to add some fresh maiden earth to the soil, when they are to be continued in the same spot. As they are liable to much damage from the wind, they should be carefully tied to stakes as they grow. The seedling plants thus treated will blow in July, and will continue in perfection till the autumn, but the first frost injures their foliage and the beauty of the flowers, which may, however, be preserved somewhat longer, by moving the smaller plants with balls of earth into large pots, and keeping them under cover in the greenhouse or conservatory.

Until a seedling plant shows it flowers, there are no means of ascertaining its value; the stems of those which produce dark flowers are generally brown, or a dark purple; whilst the paler flowers grow on plants with lighter stems, and the white flowering ones with perfectly green stems; but even these distinctions are not constant. It is worthy of remark, that those seedlings that take the lead and bloom first, seldom, if ever, produce a flower worth preserving; these are from the finest seeds and thinnest blooms; they vegetate first, and keep a-head all through the season, and can easily be distinguished by their tall habit, without side-branches; whereas the late, small plants, that require nursing to make them bloom before the frost arrives, generally produce the best flowers; as it is well known that very few of our best seedlings are ever shown the first season of their blooming. These are from the smallest seeds, and very double flowers. The proper time to judge of the full merit of the flowers, and consequently to select the plants, is the morning, for the sun injures the brilliancy of the flowers; and the summer's flowers are much superior in beauty to those produced later in the season; though in September and October, before any frost comes, the quantity of flowers which are then in blow at once, makes the show at that period the most splendid. (*Hort. Soc. Trans.*)

Mr. Glenny says that as the seedlings come up air should be given to them, to prevent them drawing. As soon as they are large enough, which will be when they have six leaves, they may be planted singly in thumb-pots, and replaced in the frame, or three, four, or more in pots of a larger size; and by the time the heat of the frame has declined, they will be strong enough to withstand the weather, if they are covered at night, and during frosts.

Those who sow in large quantities will do well to defer sowing until the beginning of April; inserting the seed in pans or boxes, or broadcast in a frame; they may then remain until planting time, when they may be planted out according to the convenience of the grower. (*Gard. and Flor.* i. 241.)

For large quantities, it would not do to let them remain in the seed-pan: to do so, it must be small quantities, and sown very thin. A moderate heat should never be used, but always a very strong one, otherwise the most likely and promising seeds would never make an appearance. The small seeds being from the finest blooms, they perish from the moisture if not sufficient heat to make them germinate at once.

Those who do not possess facilities for potting their seedlings singly, should make a slight hotbed, as heat is required for the first few days only; on which place a common cucumber-frame, with rich light soil over the manure to the depth of four or five inches, into which the young plants should be placed three to four inches from each other. In a few days the plants will allow of the lights being pulled back, should the weather be fine; in fact, on all occasions, night or day, when this is the case, the great object being to keep them dwarf; and a week before planting out for blooming, let the frame be taken away as well. The young plants should be carefully drawn from the seed pans, beginning with the most forward, leaving the late ones for another day, between which a little fine soil should be shaken, and watered with a fine rose before placing the pans again in the hotbed. Plants will continue to make their appearance, which would be lost if Mr. Glenny's plan was adopted, by giving air as soon as the first plants are large enough. If properly done, with moderate attention, stove plants can be produced from four to six inches in height. Such, of course, would bloom in excellent time.

Cuttings taken from the stems growing in the open air early in summer speedily take root, if planted under a hand-glass, with a moderate bottom-heat.

This mode of propagation is the most important for the dahlia grower's attention. We shall give full directions for the minutiæ of the process when detailing the process as applicable to cuttings from forced shoots, and observing that plants obtained from cuttings taken from the root in March are the best and most robust.

Forced Propagation.—The usual, because most productive, mode of propagating the dahlia is by placing its tubers in a good bottom-heat early in the spring, and then planting in pots either the shoots they emit, or cuttings from these.

The editor of "The Gardener and Florist" has observed, very correctly, that there are two or three rules which ought to be attended to in sending out plants thus raised. First, the grower to do any good with them should have them well rooted by the 20th of May. Secondly, they should be plants struck from original shoots of the tuber, and not tops or sides. Thirdly, they should be a week in a cold frame, merely saved from frost, before they are sent out. Nurserymen have a right to do what they like with their own, but all beyond this places the character of a flower in jeopardy. If a florist chooses to run this risk himself, well; but if he lets out dry *roots, he is at the* mercy of every hungry propagator;

and those who buy dry roots are likely to be more anxious than he who possesses a whole stock, because they know all their neighbours are at work at the same thing, and they endeavour to beat them in number: every extra plant, if only as big as a straw, is so much in their pockets; and they watch every bud, every shoot, every leaf, ready to seize upon the most remote chance of an additional half-guinea. Thus the cultivators of the dahlia have hardly fair play, because they too often pay half-a-guinea for the privilege of farming a dry root for the next season, instead of being enabled to exhibit from a plant the year they buy it. Thus it is that many a flower which has really fair claims is often condemned and discarded the first season. (*Gard. and Flor.* iii. 58.)

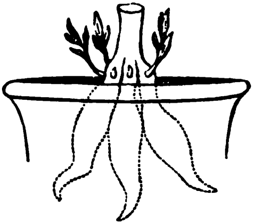
Very often, however, amateurs complain without a just cause. Their object in getting plants so early, often, is to take the tops off themselves, and thus to endeavour to grow two instead of one specimen of some favourite, and, consequently, with bad management, neither blooms in time, and the nurseryman is blamed for that with which he had nothing to do.

Forced Shoots.—This, as we have just observed, is the most usual mode of propagation. The tubers, when full grown, would require an enormous pot, unless they were reduced by cutting. Some of the lobes, therefore, may be cut away altogether, others may be shortened, and particularly those which grow outwards; so that they can be got into the pot without any soil, it is sufficient.

But many more roots can be placed in a small place without pots, on a tan-pit, or on the front platform of a house, by placing there mould four inches thick, on which putting the roots, and filling all the interstices between the tubers with rich soil.

The crown where the tuber joins the stem should be above the surface of the soil, which should be three-fourths loam and one-fourth sand, and there being first a piece of thin crock, just large enough to cover the hole in the pot, placed over it. The tuber should be carefully potted, and the soil shook or poked between all the lobes of the tuber, that it may be solidly planted; otherwise, if there be any part hollow under the tuber, and between the lobes, it will soon be a harbour for vermin. It is also necessary to cut away from the tubers every part that is decayed, and any appearance of rot, as, unless cut away before potting, it will spread, and perhaps destroy the whole, before the shoots are long enough to take off. The pots should be placed in a hotbed, or in the stove, or, in the absence of these, in the warmest part of a greenhouse; but if there be neither stove nor hotbed, it is far better to adopt the mode of parting the roots already treated; nevertheless, we have propagated in a kitchen, or other warm room, and in a greenhouse.

When the shoots, or any of them, are two inches long, if you do not want a very large increase, you may break them carefully off by pushing them a little on one side, and then back again; but in this operation the pressure must be given quite at the bottom, as well as a little way up; by placing the broad part of the thumb against the side, and pressing down on the crown, as well as against the shoot, it will be found to break out very easily, and strike as readily, if not more readily, than if cut off.



If this be done at the right age of the shoot, there is not the least difficulty about it, and other eyes will shoot round the place it was broken away from. These shoots should be potted, if you have room for them, in small sixty-sized pots, or thumb-pots, as they are called, which is the smallest regular pot that is made, one in a pot; but if, as is frequently the case with amateur growers, you are cramped for room, *put* five or six in a large-size sixty pot, round the edges, and place the pots in the hotbed where the tubers are; but it is far the better way to plant only one in a thumb-pot, from half an inch to an inch down, and close to the side, instead of in the middle, as the pot touching the plant assists the striking, though the shoots that are thus broken out will strike almost anywhere; of course the operation is the same all through. You must go over the whole of the tubers daily, and take off all that are ready, taking especial care that the number or mark the tuber bears must be attached to all that come off it, which is best done by wooden labels, neatly cut to adapt them to the small and next-sized pots; two and a half inches long, half an inch broad, and the eighth of an inch thick, pointed, to go into the pot, are the best size, for they will do even for a time after the plant is out in the ground, as well as for all the time it is in the pot. Those shoots, which are put into the hotbed to strike, will root generally in a few days, and begin to grow. They must, however, be watched daily, and the glasses kept all over them, and air must be given by tilting the sashes at the back of the frame, with a stone or piece of wood: this must be done to let out the steam, even when air is not required. The most proper way to strike these cuttings is, to prepare a hotbed on purpose, and that in which the tubers are should be kept for them only. *However, it may* happen that the grower has but one frame, and not tubers enough to fill it; in such case the tubers may be struck in the same frame. In some cases there may be exceptions, but generally speaking there will be three or four shoots come round the place from which the first is taken, so that there will be a constant succession; the number to take off daily will be increased, and the same process is to be continued to the whole, until the grower finds he has enough, when he may throw away the tubers, or part them into as many pieces as there are shoots or eyes remaining, giving a portion of the tuber to each shoot, and these portions of tubers may be cut shorter to adapt them to as small a pot as possible, but the base of the shoot must be planted under the surface, for a new tuber will be formed from the base of the shoot above the piece of old tuber, and the portion of the old one attached to the shoot will support it until the new one is sufficient to do so; when planting-time comes, the operation is much the same in all cases. (*Gardener and Florist*, ii. 25.)

Cuttings from forced shoots.—The above directions are chiefly from the pen of Mr. Glenny, and the same good floricultural authority gives the following equally correct information relative to raising plants from cuttings of the shoots so forced. The directions given are equally applicable to cuttings from shoots produced in the open air during summer. The shoots are to be allowed to grow until they have three pair of leaves, and then to be cut off just under the second pair and above the lowest pair. When one cutting is taken off, plenty of others follow, and these are to be served the same; there must be care used that the cuttings taken off are from three to four inches long and that a pair of leaves are left below, for at every leaf there is an embryo bud which will form a shoot, which shoot will in turn yield a cutting and its two other embryo buds. The cuttings, when taken off, may be struck the same as shoots, but they do not take root so rapidly. It must depend on the room you have whether you will plant a dozen cuttings round a 48-sized pot, or put one cutting each into twelve small ones; in one case but little room is taken up while they are striking, and this is often of importance. When they have struck root they must be potted singly into 60-sized pots, or thumb-pots, kept in heat a few days to establish them, and then replaced under some kind of protection till planting time. (*Gard. and Flor.* ii. 25.)

Mr. Fyffe, gardener at Milton Rectory, Bedfordshire, also recommends this mode of propagation. He says, from the newest sorts which have been purchased from the nursery (and which, in most cases, are cuttings), after they are established, or as soon as you can take a cutting without hurting the plant, take the small side shoots (the more stubbed the better), *and pot them*, as is commonly done with the shoots from the roots. These strike well when put in a good strong heat, and, by one or two shiftings, make nice little bulbs before autumn. These dry completely, and allow to remain in the pots during the winter; placing them in a dry situation, not far distant from a flue, so that they may have the benefit of it in damp weather, or when sharp frosts occur. The mould in the pots should be of a light sandy nature: a mixture of leaf-mould and sand, with very little loam, is the safest compound to preserve them in. When the roots are started in the spring, they make excellent plants; and, in most cases, four roots out of six so treated start, and thus secure the rarest sorts from being lost, as is often the case with cuttings the second season. (*Gard. Mag.* iv. 429, N.S.)

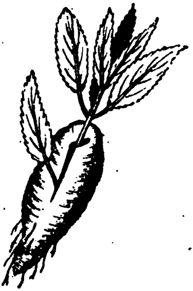
Mr. Hogg has some judicious directions for this mode of increasing the dahlia, observing that nothing is more simple and easy. Place, he says, the roots in a hothouse, about the first of March, (many begin in February,) when they readily break, and throw out young shoots, for cuttings, which ought to be taken off when three inches long, and planted in 48 pots, three or four in a pot, or one in a 60, and which may remain in the same place till they take root.

Those who have not this convenience, including most of the private growers, must provide some stable-dung and litter, about the beginning or middle of February, and prepare a hotbed, on which a cocumber frame and lights may be placed, to receive the tubers; the bed must be covered with six inches of mould, to temper the heat, and keep the steam under. If the tubers have been kept in dry mould in pots, through the winter, either in a greenhouse or cellar, they may remain in those pots, if the crowns of the tubers are not buried, and the pots may be plunged in the earth of the hotbed. If the roots are out of pots, let them be covered with mould, except the crown. The heat will have declined in about three weeks, without fresh lining, when the cuttings will be ready; so that it will be necessary to have another gentle hotbed to receive them when potted, or else fresh lining must be added to the first one. Let the mould you make use of be sifted fine, and mix with a little leaf-mould, old rotten frame-dung, and fine sand. When the cuttings are planted, water them sparingly for the first week or two, till the wounds be healed over; shade them from the sun, and cover at night with mats, in case of frost. If any hot steam should by chance rise, raise the lights a little, with a flat bit of tile or oyster shell, to let it escape, to prevent their fogging. After the cuttings are rooted, harden them to the air gradually, and pot them singly, in 60 pots; as they increase in strength, pot them again in 48 pots, in which they may remain till turned into the ground any time in May or June; *or they may be* moved again into larger pots to flower.

as such will form small compact tubers well adapted for package and carriage. These young plants are preferred to the old roots; and when trained up with single stems, form a fine head, and flower, upon the whole, better. If the ground they are planted in is of rather a free open texture, and dries quickly after rain, it is necessary to put three or four inches of manure, of any kind, on the surface, in form of a circle round the plants, to nourish the roots, to confine the moisture, and prevent evaporation; the stems and branches being of a brittle and succulent nature, should be well secured with stakes, to prevent their being broken by the wind. (*Hogg's App.* 194.)

By Eyes.—This is the mode whereby most plants of any variety may be obtained within the shortest space of time, though it is seldom practiced, and we do not recommend it. In this we differ, perhaps, from Mr. Glenny, who observes that in this mode there may be half a dozen or more plants made out of one shoot or cutting taken off properly. Suppose there be three pairs of leaves besides the end joint; the end joint, which will have two leaves, and the heart, may be cut off close to the under leaves, which may be carefully removed, and this forms a cutting; the stem left is to be split up, each half having its two or three leaves. These are to be cut close under each leaf; half the portion of split stem, and the whole of the leaf will remain, and these must be put an inch deep into the soil, each 48-sized pot holding six sets planted against the sides. The bud at the base of each leaf will make a plant if placed in a hotbed, and when they have become well rooted they must be placed in separate pots, and kept growing in heat until they are six or eight inches high, when they may be taken to a cooler frame. (*Gard. and Flor*, ii. 25.)

Grafting.—Plants thus established are not so long-lived as those sustained by their own roots, but it may be adopted advantageously to avoid the chance of losing a seedling, or any scarce variety, and is particularly applicable to those kinds which are horny-rooted and difficult to break, or such as Taylor's Sultana, with long stringy tubers, which seldom live through the winter, and to others which break late: to all such this mode is recommended with the great-



est confidence of success. The operation is exceedingly simple (see figure), and may be performed at any time from January to December (provided you have a good growing heat), not only with young green shoots, but with others more advanced, if not hollow or pithy. The usual manner is to take a scion with six or eight leaves, cut it smooth below the joint, take off one of the lower leaves without injuring the eye, and then cut away a portion (half or three-quarters of an inch) of the skin or fleshy part of the wood between each of the lower eyes. Have ready a good sound piece of tuber of the last or present season (if ripe), in which make a slanting longitudinal incision of one or two inches, according to circumstances, and about half an inch wide at the top, gradually tapering off to the bottom, and fix the scion firmly into it. The root should then be planted in a pot, with the grafted part just below the mould, and placed under a bell-glass, or in a warm close frame, but the former is best. In eight or ten days the union will be complete, and air may be gradually given; after a short time you will be able to head it down either for cuttings, if in spring, or grafts for summer and autumn. It is advisable to leave at all times four eyes, to ensure a vigorous growth, and also to shift the plant into a larger pot occasionally. The only difficulty will be in the months of November and December, when the plants are liable to damp off, because it is necessary to keep them in a green state, and just growing, but nothing more. At the end of January, or whenever you commence propagation, they can be removed to the hotbed or stove; and experience has taught that, with care and attention, they will produce a multitude of cuttings, earlier than can be obtained from ground roots. Many of the Paris florists cultivate them very extensively after this manner for the markets of Peré la Chaise and Montartre. (*Gard. Chron.* 1842, 621.)

Mr. Blake, who, from France, first introduced this mode of propagation, directs the scion to be placed on, instead of in, the tuber. He says that the cutting intended to be the scion should be robust, short-jointed, and having two or more joints or buds; it must also be procured as early in the season as possible. For the stock, select a good tuber of a single variety, taking especial care that it has no buds or eyes, cut off a slice from its upper end, using a very sharp knife, making at the bottom of the part so cut a ledge whereon to rest the scion. This is desirable, because you cannot tongue the scion as you would a woody shoot; and the ledge is useful for keeping the scion in its place whilst it is being tied. Cut the scion sloping to fit the cut on the tuber, and cut it so that a joint may be at its bottom resting on the aforesaid ledge. A union may be effected without the ledge, provided the scion can be well fixed to the tuber, but the junction will not, in such case, be so neat. The advantage of having a joint at the end of the scion is, that roots are occasionally put from that lower joint. The stem is formed from the upper joint. After the scion has been tied to the tuber with a piece of bast, the whole must be covered over with common grafting clay, and planted in a pot of fine light loam, so deep as to bury half the scion. Place the pot in a gentle heat, such as the front of a cucumber frame; the front affording greater facilities for giving the necessary shading and watering. In three weeks the root may be shifted into a larger pot, if it is too early to move it at once into the border, which will probably be the case; for, supposing the grafting done in March, the plant cannot go out until the end of May. (*Hort. Soc. Trans.* iv. 476.)

For stocks, Mr. Nash recommends dry roots of inferior varieties hept in a dormant state, and the scions to be inserted in a mode differing from either of the preceding. Cut a slit in the tuber two inches long, commencing at the top, and cutting downwards. Shape the lower end of the scion into a wedge form, and insert it in the incision made in the tuber. It may then be treated exactly as recommended by Mr. Blake. (*Gard. Mag.* vii. 38.)

Parting the Roots.—This mode is best for private gardens, where, comparatively, only a few plants are required; and the first object is to obtain speedily strongly-blooming plants. Writing upon this mode, G. A. Lake, Esq., F.L.S., of Tulse Hill House, gives us the following judicious observations and directions. From cuttings emitted by a single root, under proper treatment, several dozens of young plants may be raised in a short space of time. Consequently, this method is universally adopted by nurserymen; they annually requiring a large stock of young plants for sale; and by individuals anxious to propagate extensively a new variety. But it ought not to be practised by amateurs or others, anxious to obtain fine perfect flowers for exhibition or otherwise, for plants raised from cuttings do not produce equally perfect flowers, in regard to size, form, and fulness, with those produced by plants grown from division of the tubers, the old method of propagating the dahlia. It has been said that plants raised from cuttings, flower more abundantly than those raised by division; but to this we are not prepared to subscribe.

Physiological botany readily accounts for the different results of the two methods. The starch, or feculent matter, stored in the roots, is intended by nature for the nutrition of the animal shoots; not only until the tubers have formed, at the commencement of the vegetating season, the spongioles necessary for the absorption of the required quantity of pabula; but also when the spongioles are unable, *from drought, or* any other causes, to absorb a sufficiency of nutritient matter, to sustain the rapidity developing and vigorous vegetation.

Plants propagated by cuttings, cannot, of course, absorb the nutriment prepared and stored, during the last season, in the tubers of the mother root; and are forced to form spongioles and tubers for themselves. But the fecula contained in these latter is not, till towards the end of the year, sufficient in quantity, or sufficiently ripened by the deposition of carbon, to be, perhaps, in any way serviceable. Therefore, in order to secure a good and satisfactory bloom, let the roots be laid, in March, in a damp warm place, such as a forcing-house, gentle hotbed, or even a cellar; and, when the buds shew themselves, let each root be divided into as many pieces as may be required, retaining a bud to each piece; and let them be then planted separately in 48-sized pots. The after-treatment is the same as for plants raised from cuttings. (*Gard. Mag.* iv. 178, N.S.)

Upon this mode of propagation, Mr. Glenny remarks, that the tuber of the dahlia has rarely any bud or eye, except where it joins the stem of the last year's plant, the part called the crown; and it will be frequently found that the tuber is very small at that end. It is, therefore, of the greatest importance that in taking these up, and preserving them for the winter, they should not be broken, twisted, nor bruised at the end which joins the crown; and if they are broken, or bruised, or twisted, so as to hang loose, they may as well be taken off at once, for the crown derives no benefit from any that hang loose. These removed, it is often found that the strong ones which are left are too long to pot conveniently; but they may be shortened without absolute injury, though, as the shortening cannot be of any service beyond the convenience of potting, it should not be done wantonly. In April, let the roots be put in a warm place. Say, for instance, that the cultivator has no frame, or hotbed, or greenhouse, they may be put in a basket or box, in a warm cupboard in the kitchen. If he have a greenhouse, they may be put in the warmest part of that; or, if he have a garden-frame and glass, let it be converted to a hotbed with a few barrows of hot stable-dung, and two or three inches of soil on it, and the roots be all thrown in there, and be covered up with the glass. If the kitchen or greenhouse be all the convenience possessed, the roots must be brought there early in March. If, on the contrary, there be a hotbed, or the grower has a hothouse, the end of the month will do. The eyes will soon be developed, and begin to shoot: when these are completely shewn, the root may be cut into pieces, care being taken that there is a lobe or portion of the tuber to each eye or shoot. In this, the root is supposed to have an eye to each lobe, but it will not *always prove so.* With a strong and sharp knife, they must be so nicely separated, by a careful division of the crown, as to preserve a portion of tuber to each eye or shoot: these portions of the tuber may be shortened so as to go into a 60 or 48-sized pot, and the tuber must be sunk into the pot low enough to cover the part from whence the eye shoots. Thus potted, they may be returned to the place they came from, whether it be hothouse, frame, greenhouse, or kitchen, as near the light as possible; those in the hotbed or hothouse, to grow until the beginning of May, and then be removed to a cool frame or greenhouse, or room in the dwelling, to get hardened a little before planting out in the ground at the end of the month. Those which, for want of better accommodation, make their growth in a greenhouse or dwelling-house, may remain there, without change, till planting time. But where the quantity is too great to pot off at all before planting, the roots had better be parted as before directed, and then be planted out at once where they are to bloom: in this case it is not necessary to cut away any part of the lobe to shorten it as if for potting, but to plant in holes, with the crown three or four inches below the surface, about the middle of April; the shoot will then not make its appearance above ground till the middle of May, when it will escape the frost. If, however, any should come up early in May, they must be covered with earth to protect them. These will be quite early enough to bloom from July till the frost cuts them off. If any come up with two or more shoots, which they will if there be more than one eye to the tuber, all but one should be cut off. The treatment when planted out being the same in all cases. (*Gard. and Florist*, ii. 25.)

To promote this mode of propagation, Mr. Paxton recommends the old entire roots to be placed in a warm situation (a south border is best) and covered, except the crowns, with old bark or light soil; observing to shelter them from frost, and other injuries to which they are liable. When the buds have broken, and are an inch or two in length, the roots may be divided into as many parts as may be desired, taking care that each division has one or more promising buds.

By Autumn Cuttings.—This is a mode of propagation sometimes adopted, but it is open to many objections, and should not be practised except when it is very desirable to increase the numbers of some very rare and valuable variety. The cuttings are taken off as directed in the case of spring cuttings, are preserved in foliage through the winter, and are ready for planting out at the end of May.

SITUATION, SOIL AND MANURES.

SITUATION.—No flower is more impatient of the overshadowing of trees, or of a confined atmosphere, than is the dahlia. It is a native of unshaded plains, and cannot endure being deprived of sunshine, and a free but not boisterous circulation of air.

Mr. Wildman, therefore, does not speak too strongly when he says that, without a free and pure atmosphere, all our labours would be lost; for a dahlia, of all flowers, required a strong air;—and it was in this respect that the metropolitan florists could never compete with their country rivals. In fact, so great was the difference, that many flowers, which with the one are most desirable, are with the other, if not worthless, absolutely useless.

Hard-eyed flowers would never do in London, nor those that were thin and soft in the country: the first requires a strong air and free growth, which the latter cannot bear; as instances, he mentioned Gregory's Regina, as a useful London flower, but worth nothing in the country. Cox's Defiance, though hitherto a favourite in the country, could seldom or ever be exhibited by a London grower. Lady Cooper, again, often beautiful in the country, was useless here, the back petals falling ere the others were

›wn. The same with Hudson's Princess Royal. idnall's Queen, again, was excellent in the one place, notwithstanding the angularity of petals, which it ɜn in a great degree loses,—has the same defect. ›pe was a flower that does well in both places; so o were Unique, Maria, and Catleugh's Eclipse ıough uncertain.) Dodd's Prince of Wales, again, easily bloomed in the neighbourhood of the metro- lis, but it is always deep and abruptly sunk in the ıtre. (*Gard. Chron.* 1843, 87.)

Although the dahlia delights in a free air, yet, also, elter from high winds is essentially necessary; and, ıere masses of them are to be planted together, the lest growers must be planted farthest from the eye, d so as not to overtop the dwarf sorts. M. Fintel- ın considers the dahlia as a particularly desirable ınt for a new garden or shubbery; "because," says , "it will grow in a rich, moist soil, to the height 6 ft. in two months, and yearly, afterwards, to the ne height in the same soils, provided moisture and ınure be abundantly supplied." We notice this as ing somewhat at variance with the experience of r. Smith, of the Horticultural Society's garden, ıo states, "that if it is desirable to have dahlias vays in one situation, it is necessary to renew the l, by trenching it deeply the second, and taking it t and replacing it the third and succeeding years." *subjoins, "it* will seldom be found advisable to add manure, fresh soil is all that is necessary." We may observe, in confirmation of M. Fintelman's experience, that dahlias have been grown in the flower-garden at Hylands, on the same soil, without trenching, manure, or fresh soil, for many years; and every year they have attained, though not to the height of 16 ft., yet to as great perfection as the dahlias of the Horticultural Society's garden, or as dahlias do attain in this country. (*Pruss. Hort. Trans.* i.)

Walls facing the south and the east afford excellent protections to dahlias, therefore they may be used as screens for concealing such walls and other fences or unsightly objects, presenting, as they do, at the same time, a beautiful spectacle to the eye by the variety of their colours, from snowy white to the darkest violet, purple blood-red and blackish blood-red, sulphur colour, orange, and scarlet, in all their shades, especially if we can contrive to group the colours in masses.

Although an open situation is essential for the production of the most perfect dahlias, yet very good flowers of this genus may be grown in the borders of shrubberies, and other confined parts of the pleasure-ground. In such situations, however, it is advisable that only the common and inferior sorts should be thus grown.

An excellent situation for planting first-class dahlias, and well-calculated to exhibit their flowers to the greatest advantage, is an open border, raised at the back and sloping gradually down to the walk in front. By this position the flowers are presented to the eye in a combined broad mass. In these sloping borders the tallest varieties should be planted in the rear, and those of dwarfer habit in the front. (*Paxton on the Dahlia*, 40.)

When raised borders of this description lie parallel on each side of the walk, or have their margins tastefully broken into irregular recesses, of from twelve to three feet in depth, as well as the surface slightly undulated, the beauty and grandeur of these masses, when in flower, defy all attempts at description. Mr. Paxton adds, that not a richer, more brilliant, or more varied display of flowers could be produced from the combined beauty of any other family of plants in the whole field of vegetation.

Soil.—The best of all soils for this, and, we believe, for all other tuberous-rooted plants, is a light, fresh loam, unexhausted by being lately cropped, but without the addition of either fresh animal or vegetable manures.

At the same time, we may observe, that the moister light part of the garden is to be preferred for those dahlias which are liable to have green hard centres, as the Marquis of Aylesbury, Hudson's Princess Royal, &c., and where water can be obtained for them *conveniently*. Abundance of moisture and rapid growth causes them to produce more perfect centres. Flowers that usually come thin after their first blossoms, as Lady St. Maur, and Beauty of Sussex, should be planted in the most open situation and in a heavier soil than that best suited to the others.

Mr. Glenny says, that the dahlia grows and blooms to perfection in the soil of a newly turned up meadow, and, generally speaking, flourishes wherever the ground yields a good turnip or cabbage. The space intended to be planted should be trenched, dressed, and thrown up in ridges, from the time the plants are removed in autumn until it is time to replant them in spring. If the soil be light, it is necessary to dress it with good, rich, loam and dung—such as the top spit of a meadow, and the decomposed dung from old hotbeds. If there is any difficulty in dressing the whole of the ground, dig out holes, eighteen inches deep, and three feet diameter, and mix the stuff with the dressing as you return it to the hole. If the soil be on a bed of gravel, it will be absolutely necessary to remove it, at least to the depth above mentioned, and to make good the hole with all soil; if you cannot, with all soil and dressing, for the gravel so near the root would be fatal. (*Gard. and Flor.* i. 21.)

If the preparation of an artificial soil be necessary, the following, employed by the King of Prussia's gardener, M. Fintelman, is as good as any:—One part of the natural sandy soil from his garden, one part of soft clay, containing 10 per cent. of marl, and one part of rotten wood earth from the carpenter's yard. In this mixture, both young and old plants grow vigorously. Holes, in the situations where dahlias are to be planted, are made 15 in. in diameter and 15 in. in depth, and filled with this soil; and in these holes, so filled, the young plants are turned out, or the old roots inserted. To retain the moisture, and protect the root from excessive heat, the surface is covered with moss. Liquid manure is applied two or three times in the course of the summer. (*Prussian Hort. Trans.* i.)

Manures.—We do not agree in opinion with those who think it necessary to grow dahlias annually on fresh soil. On the contrary, we have grown them for ten or twelve years on the same border with undiminished beauty. All that is necessary is to dress the soil with a little fresh earth, mixed with decaying vegetable matters, such as old leaves, or the bottom of an old wood stack.

At the the Slough Nursery, so celebrated for fine dahlias, they have been grown in the same situation for nearly twenty years, with a little fresh soil added occasionally. The same quarter is under dahlias at the present time, which are growing with undiminished vigour.

Peat is also an excellent article to mix in the soil *when the loam is* heavy and close, if it can be procured easily. Let it be distributed all over the piece or border; if otherwise, mix it in the soil immediately where the plant is to be deposited.

Let it always be kept in mind that it is a very fatal error to imagine that the flowers of the dahlia will be improved or rendered larger by planting in a rich or highly nutritive soil; for, instead of this desired effect being thus secured, the plants will be induced to produce super-luxuriant shoots and leaves, whilst the flowers either will be reduced both in size and number, or they will be rendered coarse and deficient in beauty of form.

Where the ground is very poor, and has to be made, as it were, there is no addition equal to the soil formed by rotten turfs, cut tolerably thick, which may be estimated at one half loam and half vegetable mould; but this should be laid on in abundance, and will be far better than dung of any kind. Among the results of planting the dahlia in soil that is too rich, the principal one is that of remarkably vigorous growth, with little bloom, and that little bad. (*Gard. and Flor.* ii. 23.)

Nitrate of soda has been employed with very great improvement to the flowers when, either from the soil being poor, or other cause, the dahlias have appeared weakly. This result of private practice is confirmed by the following results of experiments instituted in the Chiswick Gardens:—

Dahlias were tried with nitrate of soda, each plant having about half an ounce given to it, mixed with water. The plants operated upon became of a fine dark green, more robust and compact in their growth; flowering rather more freely, and earlier than others which had no nitrate; it had no effect on the colour of the flowers. A few of these dahlias were, about three weeks after, again supplied with an additional ounce, mixed with water as before, but without any additional effect being perceptible; nor was any further result obtained when some of the same plants had a third half-ounce administered to them about a month after. (*Proc. Hort. Soc.* 1843, No. 17.)

OPEN-GROUND CULTURE.

THE chief points for consideration in this section of our subject are the planting—staking—pruning—watering—and protection of the plants.

Planting.—The last fortnight of May is the best time for planting out dahlias in the open border, if the season be genial; otherwise, the first or even second week of June is as good a time.

Sink a hole with the spade or trowel at each place *where intended,* five or six feet apart each way, and so deep as to place the ball of earth, if growing in pots, or the crown of the tubers, not more than four inches below the surface. Saturate the soil with water all around the tubers, and make a cup or basin on the surface, that they may be the more readily watered, the first few days, until they are established. In about ten days or a fortnight fork all round the plant, earthing up the stems, and sinking a circle all round, at 18 inches distance, making the plant stand, as it were, in a three-feet-in-diameter basin. If the stems are tall enough to bear it, tie them at once to the stakes to protect them, and put the flower-pot, from which each ball is taken, on the top of the stake; or if you have them, put the pots on the short sticks, that earwigs and other vermin may easily get into them. (*Gard. and Flor.* ii. 28.)

To forward the plants to such stage of growth, those who possess a hothouse should put each plant into a pot of 6 or 8 inches in diameter, with some good rich mould, so as the crown may just appear at the top of the pot; then place them in the green-house, where they will soon make good plants; and then, at the end of May, or early in June, as before directed, when all danger from frost is over, they may be turned out into holes prepared for them. In this manner, after being so long confined, they will grow most luxuriantly. A common cucumber frame may be successfully used, if a hot-house is not at command, to advance them in this way. (*Gard. Mag.* v. 142.)

For some time after planting out in the border, if the weather proves dry, it will be necessary to give a little water to the plants every evening, and, after doing so, to protect them from the night reduction of temperature by turning a garden-pot over each. Remove these pots early in the morning, if the weather is genial. During the day, if the sun is sufficiently powerful to cause the leaves of the plants to droop, they may be relieved by shading them with branches of laurel or other evergreens stuck into the soil between them and the sun.

Arrangement.—A light coloured flower should be between two dark coloured flowers, and the latter should preponderate in number. Mr. Sabine correctly observed, also, they look best, in a large mass, unmixed with other plants; in this plan of growing them, some nicety is required in the due distribution of the sorts, so as to have a proper and good mixture of colours, and particular care is necessary to keep the tallest plants either in the centre, or at the back of the clump, according as it is destined to be viewed from one side only, or on every point, and to place the whole so that there shall be no unevenness in the general shape of the entire mass, arising from the irregular arrangement of the individual plants, according to their respective heights. The roots should be planted about three feet from each other every way; this distance will keep each sufficiently distinct, and yet so united, that the whole clump will have the appearance of an unbroken wood or forest of dahlias. They look very handsome, if planted in the manner of an avenue, in a straight line on each side of a walk. The earliest flowers will appear in June. (*Hort. Soc. Trans.* iii. 242.)

Mr. Smith, of the Chiswick Gardens, gives the following particulars of an attempt to give the tall-growing kinds a dwarf appearance. After agreeing with the above observations as to the best arrangement of the flowers, he says, the dwarf appearance was effected by pegging down all the young shoots as fast as they grew, until the ground was nearly covered. The shoots were then suffered to grow upright, and the whole became one mass. They flowered extremely well, but rather late in the season, and never had the appearance of being higher than two or three feet and a half. The sorts selected for this experiment were those that flower most abundantly. Large-rooted plants, which produce many stems, are best suited for this purpose, because such sooner fill up the intervening spaces. The dwarf kinds ought always to be planted either by themselves, or in front of the taller ones. When planted in clumps, the effect produced by them is very brilliant. (*Hort. Soc. Trans.* vii. 161.)

This department of dahlia culture is too much neglected by gardeners, who may fill their largest beds with little trouble: all they have to do is to avoid flowers with weak footstalks, and to select those characterized by strength of footstalk; such as Perpetual Grand, Cleopatra, Essex Triumph, Cassandra, &c.

Staking.—When the plants are much exposed, or, indeed, wherever grown, they require to be supported by strong stakes; these should be put in at the time of planting, or shortly afterwards; for, if this work be done later, the roots will be injured by the stakes in driving them down; this hurts the plants when advanced materially, sometimes even killing them. (*Hort. Soc. Trans.* vii. 162.)

They require to be thus supported to keep them from being broken down, not only by high winds, but by the mere weight of their own flowers and foliage during heavy rains. The best fastening for them is the green cord used for window blinds.

Stake them with one large stake, to be permanent, and secure the plant sufficiently loose to allow the stem to swell. Add two small stakes at right-angles, to which the plant must also be secured; this will keep it in a firm position during the worst weather. Add large stakes as the plant advances, and keep the side-branches secured. In this particular, there is generally some neglect; by deferring the tying until *it can be done* all at once, an unexpected high wind may strip the plant of half its branches. Do not tie the branches to the stakes in a bunch, but train them out separately, so that the leaves may be well exposed to the light and air. This is essential for the production of fine blooms. (*Turner's Practical Observations on the Dahlia*, 2.)

Sometimes the dahlia is trained in an espalier form, which can only be done by arranging the shoots whilst they are very young. They are trained according to the fan system, the main stems being led out diagonally, and the centre filled by the branches trained horizontally. There should be horizontal bars to form the trellis, as well as upright stakes.

The frequent use of the hoe, not only to destroy weeds, but to loosen the soil's surface, is very beneficial.

Pruning requires to be done very sparingly, and, indeed, is seldom required, unless it is desired to have only a few very fine and perfect flowers. It should be done as soon as the shoots show themselves; and the lower ones alone should be removed. It is not a good practice to take away the leader. (*Gard. Chron.* 1843, 361.)

Do not allow the plant to become full of small branches, and then removed at once; all superfluous shoots should be cut away as the plant progresses. It is also injudicious to subject each variety to the same amount of thinning; for, by such treatment, as much injury will be done to some kinds, as good to others. Those that are generally too large and coarse must be spared; when such varieties as require size only should be thinned considerably. No precise rule can be laid down; and nothing but close observation in this important particular will enable the operator to practice it successfully.

Nearly the same rules apply to disbudding. Those requiring to be reduced in size must be left until a later period of their growth, which will bring the flowers more compact, with smaller petals, and better general form.

We know that we are in opposition to the opinions of some, in thus recommending very slight dahlia pruning, for it is a common notion that, the more you cut away of a dahlia, the more you invigorate the remainder. Nothing can be more erroneous, says Mr. Glenny, than the adoption of such extreme measures. The only pruning a dahlia should have, is the shortening of those branches which impede other branches, and the removal of superfluous flower buds. It is desirable to prune shoots and leaves which are likely to touch a flower, for the friction of a leaf is quite enough to destroy a bloom; but, beyond the convenience, the shapeliness, and free growth, of all the parts of the plant which require the occasional removal of shoots, nothing more should be done to strengthen any particular bloom than the stopping of any shoot that is above it, and the removal of some or all of the other flower buds on the branch. (*Gard. and Flor.* ii.)

The plants should be well looked to the first month after planting out; whatever shoots appear below, where the plant is observed to be swelling to the greatest size, should be removed when in a young state.

Judicious pruning and thinning will keep up a fine head of bloom until the frost arrives, let them be as early as they may; but if there is much to cut away at any one time, nothing can be more certain than that the plants have been neglected.

Watering.—In common with other garden plants, rain or pond water is the best for the dahlia; and when once established, it does not require watering more than once a week, even in very dry weather.

Mr. Glenny is of the same opinion on this point of its culture. He says, after a plant is established, water should be given but seldom, and when given let it be as good a soaking of the earth as it would have in three hours' rain; but if this cannot be done, they should be watered all round the plant for eighteen inches, and not on or close to the plant, for water administered close to the stem is baked up by the heat of the surrounding soil, and does not reach the fibres at the extremities; such watering, ten times a day, would not be so effective as a good soaking of the ground once a week; the former checks the progress of the root, while the latter encourages it. (*Gard. and Flor*. i. 22.)

If, on turning up the earth, it is found moist within two, three, or four inches down, it is better to wait a short time for the chance of rain, than to tamper with the plants by applications of water at the root only. (*Gard. and Flor*. iii. 66.)

Use soft water, if possible. If it is not naturally so, pump it, in the morning, into tubs or tanks, leaving it to the action of the sun and air; to be used in the evening. When the plants have become large, it will be necessary to give them considerable quantities at a time, instead of frequent waterings; but this, of course, will depend upon the state of the weather, soil, &c. On no account neglect giving them a slight sprinkling overhead, through a fine rose or syringe, in dry weather, after the sun has left them; as the dew following this operation, will keep the plants in a wet state until the following morning, which will be a preventive of the thrip, and keep the earwigs from eating the points of the young shoots, which they often do before any blooms appear. The colour and size of the foliage will also soon show the beneficial effects of this practice. (*Turner on the Dahlia,* 5.)

To preserve the moisture in the soil, and to avoid the necessity for watering, some persons mulch their dahlias. There are objections to this, although, with care, it is very effective. First, the litter harbours vermin, and particularly the earwigs and slugs; secondly, as the litter keeps the earth moist upon the surface, the roots come actually through the soil, and may be seen at the top on removing the mulching; and then, if from neglect the surface becomes dry, the plants receive such a check as to take a considerable time to recover, if they ever entirely do so. Notwithstanding these objections, we recommend mulching, for there is no fear of earwigs harbouring in the manure used for mulching, if it is kept properly moist; and as for slugs, there should be none, for cleanliness will always keep them down.

Tying-up, when the plants are of full stature, requires particular attention: in August, especially, the blooming plants must frequently be looked to, in order to provide any supports that may be required. The greatest care must be observed that the ties are attached firmly to the stem. Dahlias grow fast, and the ties being hid by the foliage, are particularly apt to suffer from oversight on this point. But the greatest injury is to be apprehended from slugs or snails, particularly the black snail (Limax ater), which inhabits shady places. A sure preventative to its depredation is a circle of common coal-tar poured round the stem of each plant; let a small ridge of earth be made within this circle, so that water or liquid manure may be applied when necessary. (*Gard. Journ.* 1845, 488.)

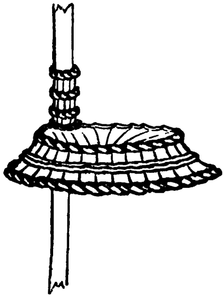
Shelter, both from wind and sun, is essential for the lengthened continuance in beauty of the dahlia blooms when expanded. Mr. Glenny observes, wind and sun are both detrimental; and the practice of fixing the blooms in the centre of a flat board, and covering them with glass or flower-pots, as they may want light or shade, is becoming general. The more easy way is to use a paper shade for any particular fine blooms; for, however the flowers may be coaxed and nursed under cover, a stand of blooms grown finely, and merely shaded from the hottest sun, will beat all others in brilliancy, and in standing carriage, and keeping. It is right to go round the plants, and wherever there is a promising bud or bloom, take away all the leaves and shoots that threaten to touch it as they grow; take off also the adjoining buds, and, if the weather be windy, make it fast to a stick or one of the stakes, that it may not be bruised or frayed; shade it from intense sunshine, and it will so profit by the air and night dews, as compared with the blooms under pots and glasses, that, if the growth be equal, the blooming will be superior. Nevertheless, people will cover; and where there is a disposition to a hard eye, this will hardly come out perfect unless it is covered. As the end of September approaches, or as soon as you have done with the bloom, earth up the plants, that when the frost comes *it may not reach* the crown.

Although shading moderately and judiciously is very essential to enable the flower to attain and to prolong its most perfect beauty, yet the amateur often practises it most mistakingly. By being too anxious he gives himself extra trouble, and at the same time spoils the blooms he so much wishes to preserve, by shading them too long before they are wanted; shading out of character many of the light flowers, and making all tender, and less able to bear a journey, or exposure when put up for competition. It is requisite to shade some light flowers, and some of the yellows, earlier than others, in order to produce them clear and distinct: when, on the other hand, those with slight tips, or marking, must be deferred; otherwise, the face of the bloom would be without its characteristic feature, and wear an indistinct blush, instead of the attractive tip or edge.

The time required for shading before a given day when the blooms are wanted, must, in a great measure, depend on the weather. Four or five days will be sufficient for an early show, but, as the season advances, extend the time; and secure the buds or young blooms likely to be good, from friction against the neighbouring blooms and foliage, by tying them to stakes, or parts of the plant. (*Turner on the Dahlia*, 4.)

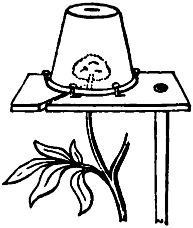
The basket-shade, of which the accompanying sketch is a representation, effects all that is necessary

—it shelters the flowers in stormy weather, and it protects them from the scorching midday sun; these objects are attained without depriving the flower of light and air, which are essential in bringing to perfection the beautiful and intense colours of the dahlia. This protector is made of wicker-work, and consists of an inverted shallow basket, to which is attached a tube made of the same material, through which the dahlia stick is passed, and a peg being inserted between the stick and the tube, it is firmly secured at any height required. It measures 12 inches diameter in the widest part, and is 3½ in depth. From its being made of so light a material, and from its simplicity of construction, it is not easily displaced or put out of order, and the flower not being confined within any thing, is less liable to be damaged by coming in contact with any substance that would injure the petals. It requires to be painted to preserve it from decay, and



if the outside be made green, and the inside white, the appearance of them would not be disagreeable, and the insects lurking inside would be easily perceived. (*Gard. Chron.* 1841, 181.)

Another shade is made of hazel-rods from two feet to seven feet long, according to the height of the flower to be shaded, and about an inch in diameter; point them at one end, to insert in the ground, and nail on the other a thin piece of deal six or eight inches square.



The board must have a hole in the centre to admit the stem, and by making a cut with a saw from the outside to the hole in the centre, the flower may be slipped through without injury; and to keep it in its position the branch may be tied to the rod. When the flower is fixed, invert a pot over it sufficiently large to cover it without touching the petals, and the blossom will be protected without injury, and all the beautiful shades of colour preserved which otherwise would be destroyed by the sun-light, the hole in the bottom of the pot admitting sufficient. The flowers should be placed under the pots when little more than half blown, and in hot dry weather they will be benefited if the pots are taken off, immersed in water, and replaced during the heat of the day. In rainy weather the wet should be excluded by putting a piece of slate over the hole of the pot, which also prevents earwigs from entering; if this were done every night, and the board oiled, these dahlia pests would be almost entirely driven away. To prevent the pot from being blown off, a few nails should be driven round the outside of it, or it may be tied on with matting.* (*Gard Chron.* 1841, 165.)

A third description of shade is made of wire, and covered with paper or canvass, which, to stand the weather well, should be painted. The form of the shade may be as shown in the next diagram: the stick on which it is fixed should have a few holes through it, at different heights, through either of which holes a peg may be thrust, to keep the shade at its proper height, and the stick may be stuck in the ground upright, or sloping, whichever is best adapted for the purpose of keeping off wind, rain, and sun;

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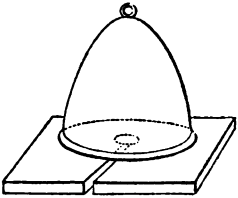
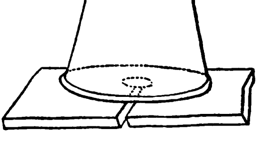
* The pot does not require to be made fast, but should be removed as soon as the sun has left the blooms, leaving them exposed for a few hours, if the weather is fine, during the evening.

and the stem of the flower to be preserved should be tied to the stick itself, to keep it steady; and great care must be taken to cut away any leaves, branches, or buds, that can be blown against the flower by the wind; for the slightest leaf will fray and spoil a bloom if it rub against it but a few minutes. (*Gard. and Flor*. ii. 29.)

The Norwich growers have two, we may say three, kinds of covers, for they have solid ones made for covering up dark, thus—



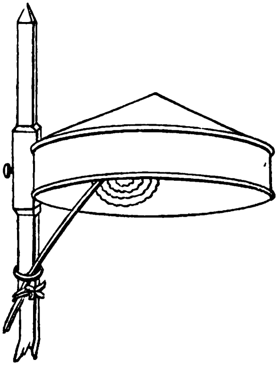
They have also glass covers to cover up light; but an improvement has been adopted—a cover like a flower-pot, without a bottom, that they can cover

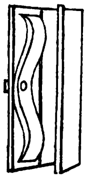


either with a glass to let in light, or with a piece of wood to keep it dark.

These have a groove in the bottom to allow the glass or the wood to be cut round to fit it, so that the wind will not blow them away; but an improvement would be to use a cover made of the same material as the pot, so that, without taking the glass off, the flower might be darkened. (*Gard. and Flor.* ii. 29.)

But the most elegant and effectual shelter and shade is that designed by Mr. Turner, florist, of Chalvey, near Slough, the co-editor of this volume. Its other merits are, that it is simple in structure; managed with ease, and adapted for general purposes. It is suitable for all flowers—dahlias, roses, pinks, pansies, &c.—and, from the simplicity of its construction and easy management, it can be placed at





A

any required height the length of the stalk allows, and that instantly.

The shade is made of tin, 10½ inches in diameter, the band 2½ inches broad, and the crown rises about 3 inches: to the shade is attached a tube, furnished with a spring (fig. A), which, when the stake is introduced, presses it firmly, and keeps the shade at the height required. The spring, in this instance, was made of double tin, but a well-constructed spring would be an improvement, and be less liable to get out of order. A screw would be better than a spring, as represented in the annexed cut. They are painted white inside and out; but their appearance in a garden would be less objectionable if the outside received a coat of green. When the flowers are tall, the stem should be tied to the stake to prevent injury from motion caused by the wind.

Autumn frosts.—These destroy at once the beauty of the dahlia, not only by injuring its petals, but by breaking down the tissue of its leaves. They are thus rendered more unsightly than ornamental, but, if it be again cultivated the following year, on no account cut down the stems early in the autumn, for this will ensure the rotting of the tubers through the winter, from their immature state, and the superabundance of fluids the roots contain. We have experienced this from those which we have been compelled to cut down in conspicuous situations perishing, whilst others, which had their injured parts only removed, and their roots protected from heavy rains by having a layer of dry old tan placed round them, were preserved in health. (*Gard. Chron.* 1841, 601.)

Autumn and Winter treatment.—Although it is injurious to remove the stems which have been damaged by frost early in autumn, yet Mr. Sabine was quite correct in directing that, later in that season, soon after the leaves and young branches of the plants have been destroyed by the frost, they should be cut down. Those which are to be left in the ground must be protected by small heaps of dead leaves or tan, and if kept quite free from the attack of frost, or injury by damp, will grow well the next season. But it will, in general, be advisable, especially with the more valuable kinds, to raise them from the ground with their roots and tubers entire, retaining a small portion of the stem attached, to plant them in pots in dry mould or sand, and so keep them in the back of a green-house, or other dry and airy place, free from the access of frost until the spring. The object of the preservation of the roots during the winter, is to keep them sufficiently moist to preserve them plump, and yet not so as to be rotted by damp or spoiled by frost; any situation, therefore, where this can be effected, will answer equally with the more troublesome plan of potting each root: they will do very well if laid on a cool floor in a greenhouse or fruit-room, and may then be covered with coal-ashes, sand, or other dry substance; but when thus covered, they should be placed with their crowns erect, and exposed to the air; the under parts of the roots only should be covered over, exactly as if they were planted. (*Hort. Soc. Trans.*)

Take care that each root has its name attached to it, written on a piece of lead or zinc, and fastened to it by wire.

We are of opinion that the unnatural treatment of dahlia tubers, such as storing them for months quite dry, and then forcing them to produce an unusual amount of shoots in the spring, will by degrees bring upon this flower disease similar to that which ravaged the potato last year. We are sustained in this opinion by the fact, that dahlias out all winter in open beds, without any protection whatever, are much more strong and healthy than those the roots of which have been wintered under cover in pits. And Dr. Lindley goes so far as to state as his opinion, that dahlias might be rendered hardy without much trouble; and that, by being out all winter, they would be less liable to be affected by frost early in autumn. (*Ibid.* 1844, 336.)

Examine the stored roots during winter, lest any should get mildewed, or begin to decay. If mildewed, they must be wiped clean, and dried, by being laid on the hot water pipes or the flues of the greenhouse, or before a fire; and those which indicate rot must have every spot cut away: some may be found shrivelling; these should be potted directly, but not forced until the usual time. (*Gard. and Flor.* ii. 31.)

Growing Dahlias in dwarf masses.—Mr. Paxton has given the following directions for effecting this growth. Dahlias of a dwarf and peculiarly florescent habit only are suitable for this purpose; an old kind, called Ranunculiflora, is held in estimation. In raising the plants, attention should be directed to prevent them being highly stimulated, or luxuriance of disposition created, it being unfavourable to a satisfactory production of bloom. The soil to grow them in should be selected of a free, rather light, and perhaps slightly poor description. In planting, the plants should be placed so as to be nearly flat on the surface of the soil, and secured with a hooked peg. After management consists in pegging down, as they continue to grow, the leading and main lateral shoots, leaving the remainder to rise and flower unsecured, excepting in case of their extending so much upwards as to break the uniform appearance of the mass; few shoots require more than once fastening. Care must be taken that in bringing any down they are not broken off or injured; the surest preventive against which is to go over the plants regularly, fastening the shoots down while they are young. Some branches will require cutting away to prevent the plants crowding upon each other. Managed in accordance with these directions, the main point, choosing proper kinds, being regarded, a splendid mass of bloom, finely contrasting with dark green stems and foliage, the whole rising from a foot to two feet high, produces in appropriate situations a very fine and unusual effect. (*Paxton's Magazine.*)

Growing in Pots.—To grow dahlias in pots, you must select the dwarfer and more freely flowering kinds, the taller ones being totally unsuited for that purpose. After they are started, and when the shoots are about three or four inches long, pot them singly into small 60s, in any light rich soil; water them freely, and place them in a hotbed, keeping them close for a day or two, and shading them during sunshine. They will (if properly attended to) be rooted in about 10 days, and should then be removed to a much cooler place, and have plenty of air. When well established, shift them into larger pots, and finally, before placing them out of doors, repot them either in 12s or 8s, according to the size of your plants. Top the leading shoots to make them bushy; and when the danger of frost is over, they may be plunged in the open border, which saves much labour in watering; but even then they must be watered copiously in dry weather. They will flower freely all the summer and autumn, although the blooms will not be so fine upon plants grown in pots as upon those in the open border. After flowering, cut the tops off, and place the pots containing the roots in any dry cellar, or other place where they will be secure from frost during the winter. Young plants struck from cuttings, flower much better in pots than the old roots. (*Gard. Chron.* 1842, 353.)

If early blooms are desired, small roots should be selected, as they are always the most forward in vegetation.

FORCING.

The dahlia bears forcing, without detriment to its peculiar beauties, better than most florist's flowers, and apparently because the rapidity of growth being inimical to the production of the prime organs of reproduction, by so much are friendly to the development of this double flower; those organs being transformed into petals. Be this as it may, the dahlia bears forcing, with little prejudice to its beauty; by potting the tubers in February, and allowing the pots to remain within a frame, or in a cool greenhouse, until June, when they will begin to bloom, and they may be turned out then into the open borders.

To hasten them still more, and further to prolong their endurance, the following system may be adopted; *for, although out* of doors, the dahlia yields flowers later and more strongly when not raised in heat; yet, to have early flowers a hotbed is necessary. Keep the tubers dry and warm, and so soon as they start pot them, leaving the crowns about one inch above the soil. When the shoots are sufficiently long, shift them into large 60-sized pots, and keep them in a room having a south aspect, but without fire. They will flower from early in June until the end of November. (*Gard. Chron.* 1845, 70.)

We have already averted to the groundless condemnation with which the florist is occasionally visited, because the plants furnished by him to the amateur, do not, the first season, appear to have the excellent qualities possessed by its parent. We alluded to the causes of this, and warned our readers against a hasty conclusion; but since those observations were penned, we have met with the following excellent observations by Dr. Lindley, and as they relate to the consequences of forcing the dahlia, they may be here introduced appropriately.

The dahlia, observes Dr. Lindley, when it first springs from a seed, begins to form a fleshy-fingered root, in which is immediately stored up the organizable matter elaborated by the leaves, and out of which the flower is to be formed. If the summer is long and warm, or circumstances are otherwise favourable, this plant will flower the first year, but feebly, and by no means so well as it will at a later period. If the fleshy roots are allowed to remain untouched during the first winter, the store of food in them is undiminished; and the second year the seedling will flower with all the attributes that may be peculiar to it, there being a constant supply of organizable matter from the roots equal to the demand that may be made upon it. But if the root is allowed to go on enlarging and filling with such matter for a third year, the quantity then stored up becomes so great that over-luxuriance is induced, and leaves are produced in more abundance than flowers; and thus the beauty of the individual is impaired. If, on the other hand, a root well prepared for flowering in the most perfect manner is forced continually to produce shoots which are abstracted for cuttings, it by degrees becomes exhausted of the organizable matter stored up in it, and at last the cuttings contain so little matter of that kind, that they are in the same state as seedling plants—namely, possessed of the power of growth, but destitute of any supply of properly prepared matter out of which perfect flowers can be formed. The consequence of this is, that plants obtained from early cuttings flower well; from the next supply, worse; from a third crop, worse still; and so on. Again, if a dahlia plant struck from a cutting ill-prepared, or even well-prepared, to flower, is itself compelled to furnish other cuttings, it will become *exhausted by* the cuttings it has yielded, because it has no supply of organizable matter on which to draw; and these cuttings will produce plants in a still further stage of debility.

If these statements are rightly understood, they will be found to explain some things that the buyers of dahlias do not seem to be aware of. Many an honest nurseryman has been regarded with suspicion by his customers, because the dahlia plants that he has sold have not answered to sample; in other words, because they have produced flowers very inferior to those of the variety they have been sold for. And yet, in reality, the vendor has been perfectly correct in his dealing, but the plants he has propagated, have been debilitated by the excessive demand for them. No blame can attach to a nurseryman for this. When a seedling is raised, it is but a single plant; it gains prizes, is talked of, and gets into request; and straightway hundreds of plants have to be propagated from that one, in order to meet the sudden demand which, under such circumstances, is sure to arise. Of these plants, a large proportion must necessarily produce bad flowers the first year; but they will recover their character the second year, and for that second season all reasonable florists will be content to wait. (*Ibid.* 1841, 227.)

DISEASES.

Gangrene of the Tubers.—This putrefaction of the dahlia tubers, like that which of late years has appeared more generally in those of the potato, appears to be occasioned by unnatural treatment; such as sudden transition from extreme dryness to moistness, from high to lower temperatures, &c.; for it afflicts, chiefly, those tubers which have been kept dry through the winter, and are removed to the open soil in the spring; that have been preternaturally forced to emit shoots, and then are committed to the natural soil and temperatures of our climate. The obvious remedy is more natural treatment.

Instead of keeping the tubers throughout the winter dry, and freely exposed to the air, let them be stored in sand or earth gently moist; or let them remain under an extra depth—about a foot—of soil in the borders where grown.*

Running, or Variableness of Colour.—Dahlias, like many other flowers, are subject to this mutability or uncertainty of colour, and which, in some, is so striking as to have given rise to their specific names. *Gladiolus versicolor* and *Hibiscus mutabilis* are very notable examples of this protean quality.

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* *This subject is* more fully discussed in the first volume of *this series,* "The Potato; its Culture, &c."

The cause of this changeability is somewhat uncertain. It is upon the oxygen, combined with their parenchyma, that the colour of a petal depends; for sulphurous acid (the fume arising from a burning match), which has a most powerful affinity for oxygen, destroys the hue of all coloured flowers, though it leaves that of white flowers unchanged. Mr. Smithson's experiments, and those of M. Schubler, seem to indicate that the colouring matter of flowers and fruits is fundamentally blue—rendered red by acids or the addition of oxygen, or yellow by the presence of an alkali or the subtraction of oxygen. Mr. Smithson says that the colouring matter of the violet is the same in the ruddy tips of the daisy, geranium, blue hyacinth, hollyhock, lavender, and various plums, in the leaves of the red cabbage, and in the rind of the salmon raddish. The acid which causes the red tint seems to be usually the carbonic.

Remarking upon the mutability of colour in some dahlias, a very sensible writer has observed, that such has been the improvement in this flower that it would be almost impossible to recognize Antagonist, Cleopatra, Essex Bride, Marchioness of Ormonde, Lady Antrobus, Admiral Stopford, Beauty of England, or Oakley's Surprise, as descendants from the star-shaped *Dahlia variabilis*, introduced about the year 1800; but although the single purple and yellow dahlias of that day have been changed into colours far more brilliant, and of almost every tint—and although an ideal form of symmetry has been all but obtained, as in Keyne's Standard of Perfection—yet one thing still remains to be accomplished, viz., the fixing of colour in those usually called "fancy" varieties. This has hitherto baffled the skill of the most experienced cultivators. Why purple flowers with white tips should be inconstant, and white flowers with purple tips remain constant, has alike puzzled the botanist and florist; no two persons agree as to the cause, or have been able to suggest a certain remedy. Some attribute it to richness of soil, but proof is not wanting that it occurs very often upon the poorest lands—even upon sand and gravel; others suppose it to be occasioned by a humid atmosphere; but although these may be, and no doubt are, accessories, it must be obvious that they are not the primary cause. In Paris, where the soil is poor, and the summer and autumn usually dry and hot, there is as great an uncertainty as in the comparatively damp atmosphere of Belgium and England; one season they may be seen true, the next selfs. Sometimes a plant will only produce two or three good flowers; at other times one branch will be found bearing variegated flowers; others will come constant here, but bad elsewhere; in fact, so uncertain is the whole race of tipped flowers, that not one single variety can, with any certainty, be guaranteed to keep its colour. Many of them are said to be constant, but that has only reference to some particular locality. The selfsame kind has been found totally different elsewhere; for instance, Oakley's Surprise, Modesta, La Lionne, and Beauty of England, are of this number. There is no doubt that the disease may be accelerated by richness of soil and pruning; on the other hand, it is in some degree prevented by planting pieces of old roots instead of yearly cuttings; it is true, the flowers will not be so large, but certainly much earlier, very abundant, and more constant. A still better plan is to flower pieces of roots in 12 or 16-sized pots, plunged an inch or two below the surface; but it is best of all (at least, such is the opinion of French florists) to graft all tipped varieties; and certainly no one can walk through the Paris markets in June, July, and August, without being struck with the number and beauty of fancy dahlias: you may see hundreds of plants, from 18 inches to 2 feet in height, with blooms as regularly tipped as you could possibly desire. (*Gard. Chron.* 1845, 102.)

We have no doubt ourselves, that the variableness of colour is mainly, if not entirely, dependant upon the fertility of the soil, and that the discordance of opinion arises from a non-attention to the particular colour which is the subject of change. It is a matter of certainty that more colouring matter is developed by plants growing upon a rich soil, than by others of the same species vegetating at the same time upon a poorer soil; and we have also observed, that fancy dahlias, in which white predominates, growing on a rich soil, have in every flower more of the dark colour peculiar to them, than the specimens growing on less fertile ground. But where the dark colour predominates, this is liable to vary, and to give way to the paler colour associated with it in the florets, when cultivated on a poorer soil.

We have little doubt but that it was a dahlia with white or other light colour predominating, which was the subject of the experiments mentioned by a writer in Hovey's "Magazine of Horticulture." He says, that striped dahlias will be best kept clean by planting them in poor soil, while rich soil invariably runs them. He relates the following experiment with a variety called *Striata formosissima,* in which he is confirmed by Mr. Hovey, who says he has the same results. No. 1, planted in poor, gravelly soil, in an open situation, had all the flowers but two beautifully mottled. No. 2, planted upon a rich, cool, sandy loam, had not one-half of its flowers mottled. No 3, three plants in a soil very highly enriched, had every bloom but one self-coloured.

Change of Form.—Fancy dahlias are quite as liable to this variation as to mutability of colour, and it is quite, if not more singular than variation of *colour.* The complete difference which is often observable in the size and form of petal of a tipped flower and a self of the same variety, and not unfrequently upon the same plant, as in Modesta, Nihill Surprise, Striata rosea, Esmeralda, and others, is very striking. So great is the alteration, that no one could know them to be the same sorts, except from their foliage and habit of growth. No one can hesitate from agreeing that this change also arises from the different degrees of fertility possessed by the soils on which they are grown.

INSECTS.

Every part of the dahlia is subject to predatory attacks: its tubers to those of the wireworm; its leaves to those of the aphis and slug; and its flowers to those of the earwig.

The Wireworm, which attacks the tubers of the dahlia, is the larva of a species of click beetle, spring beetle, or skip jack, bearing the specific entomologica, name of *Elater sputator*. It similarly attacks the potato, carrot, and lettuce.

This insect belongs to the order Coleoptera, or beetles, and to the family of Elateridæ. There are nearly seventy species natives of the British Isles, but there are only six of the Elater genus, and to these

Mr. Stephens has applied the generic name of Cataphagus, as indicative of the destructively devouring powers of their larvæ. Their ravages are the more to be dreaded because the larva remains in the form popularly known as the wireworm for five years, during the whole of which time it is preying upon the roots of plants.

The four species, the wireworms of which are most injurious to our crops, are the Elater sputator, E. ruficaulis, E. obscurus, and E. lineatus. As the habits of these are for the most part similar, we extract the following general description of the click beetles and their larvæ, as given by Mr. Cuthbert Johnson, in the *Farmer's Encyclopædia* :—

Click beetles are readily known by having the sternum produced behind in a strong spine fitted to enter a groove in the abdomen, situated between the intermediate pair of legs. By bringing these parts suddenly into contact, the insects are enabled to spring to some height into the air, and thus recover their natural position when they happen to fall on their backs, which they frequently do when dropping from plants to the ground. A special provision of this kind is rendered necessary in consequence of the shortness and weakness of their legs.

The wireworms have a long, slender, and cylindrical body, covered by a hard crust, which has obtained *for them* the above name. They are composed of twelve segments, fitting closely to each other; and are provided with six conical scaly feet, placed in pairs on the three segments next the head. The latter is furnished with short antennæ, palpi, and two strong mandibles or jaws.

To remove the wireworm from a soil, no mode is known but frequently digging it, and picking them out, as their yellow colour renders them easily detected. To prevent their attack upon a crop, mix a little spirit of tar, or a larger quantity of gas-lime, with the soil. It has been stated that growing white mustard drives them away, and it it is certainly worth the trial. To entrap them, and tempt them away from a crop they have attacked, bury potatoes in the soil near the crop; and if each potato has a stick thrust through it, this serves as a handle by which it may be taken up, and the wireworms which have penetrated it be destroyed. To decoy them from beds of anemones, ranunculuses, &c., it is said to be a successful plan to grow round the beds an edging of daisies, for the roots of which they have a decided preference.

If a crop be attacked, as the pansy or carnation, our only resource is to bury in the soil other vegetable matters, of which they are fonder than they are of the roots of those flowers. Potatoes, with a string tied round them to mark where they are, and to facilitate their being taken out of the soil in which they are buried; and carrots similarly thrust into the earth where the wireworm is ravaging, are successful lures. The vermin prefers these, buries itself in them, and may be easily removed. The roots of the white mustard also are said to drive the wireworm away from the soil on which it is grown. (*Brit. Farm. Mag.*)

Mr. Glenny says, that Mr. May, nurseryman, Tottenham, plants the common daisy round his principal beds, finding the wireworm prefer it to the carrot. (*Gard. Gazette.*)

And Mr. Oram, Edmonton, says that the double daisy is employed by one of his friends, who, in one summer, from a row of daisies three hundred feet long, has taken 2,000 wireworms. (*Gard. Chron.*)

It is not generally known that the mole destroys great numbers of the wireworm, nor that pheasants are very fond of them. Mr. Westwood says, he has heard of instances where the crops of these birds have been found to be filled with wireworms.

Slices of lettuce are found to be more alluring to the wireworm than even slices of potato or of carrot, and more than one respectable testimony can be adduced that if lettuces are grown among dahlias, which they may be, easily, without being seen, the roots of the latter will always remain untouched. Whatever lures are employed these should be examined daily, the wireworms they contain be destroyed, and fresh *slices introduced* as requisite.

Nitrate of soda has been recommended as offensive to the wireworms, and it may be so, but we can decidedly recommend, both as offensive and destructive to this marauder, the gas lime. This, which is an impure sulphuret of lime, and mixed also with sulphureted hydrogen, is most destructive of insect life. Earl Talbot has tried it extensively on his farms, and reported it to the Royal Agricultural Society as highly efficacious.

The Earwig (Forficula auricularia) is an insect too well known to need particular description; yet, common as it is, few persons are aware that it is a winged insect, and that all such remedies as tying wool, &c. round the stems of dahlias to prevent its ascent are consequently nugatory. The wings are transparent, of large size, and, when expanded, are shaded like a fan. When not in use, they are folded up beneath two small horny wing-cases, and being quite concealed, to common observers the insect appears wingless. It delights in shady, damp places, and advantage is taken of this to entrap it near the flowers on which it feeds.

The petals of the dahlia are its favourite food; and Mr. Marnock, in remarking upon this, justly observes, that blooms for ornament and for exhibition are two very different things: the former should be looked for in varieties of small growth, which throw their blossoms well out from the foliage, and are of a decided colour; and so long as they are tolerably double, nothing first-rate is required as to form and such like properties. For exhibition the case is different; no matter what the habit, hardly the colour, so long as the form and arrangement of the flowor can be brought near to the ideal of perfection. One of the greatest obstacles in the way of this is the ravages of the earwig, which always is productive of more or less injury. To avoid this, various plans are resorted to for trapping these vermin, such as hanging bean-stalks, or any other hollow tubes, among the plants; or inverting small pots, partly filled with moss or littery hay, on the stakes, and then examining them every morning, and destroying all the earwigs which have sought concealment there.* But this is not enough: the flowers must be fixed in the centre of, and just above, small temporary tables, and covered completely during night, and partially during the day, by inserting a flower-pot over each; cotton, wool, or other means being also used to prevent the insect crawling up through the slits made to admit the stalk of the blooms to the centre of the boards. Some use glass instead of pots, but generally shade is preferred, though often indulged in to an extreme. However artificial the blooms may be which are thus protected, they are far more beautiful both in sunny and stormy weather than others which are not protected, aswell as being preserved from the depredations of the earwigs. (*Gard. Journ.* 1845, 600.)

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* That a garden-pot upon the summit of the dahlia stake is not ornamental, must be readily admitted, though its offensiveness is much mitigated if the pot be painted green. Small ornamental cupolas, similarly painted, would be far preferable, and a clumsy attempt at this is represented at p. 190 of the *Gardener's Magazine*, vol. 5, N.S.

No labour should be spared by the dahlia grower in searching for these insects, and Mr. Glenny wisely advises that it should be begun from the moment the plants are out. Bean-stalks, small flower-pots, and hollow tubes of any kind, should be placed close to them when they are first planted, and be examined twice or three times a day. One earwig killed early may prevent the plague of a whole brood; and the cultivator who neglects the precaution because there are so few, little thinks of the consequence of not destroying the heads of families. In short, if this early and apparently troublesome method be not persevered in, ten examinations per day will hardly keep them down when the blooming time arrives. When the plants are small, the pots which the plants come out of should, with a bit of moss put inside, be placed on sticks a foot high; bean-stalks, in six-inch lengths, should be laid on the ground; and every earwig trapped at this early period is worth a hundred taken in blooming time. Let a boy go round three or four times a day, if there be any quantity; but if you can attend to this work yourself, do it. (*Gard. and Flor.* i. 22.)

Thrips ochraceous is a minute plague, nibbling off the blooms, and leaving white patches and specks; and if they infest a plant before it blooms, its growth is checked, and sometimes past recovery. The thrips being a fly is not easily destroyed; but, as in the case of the aphides on out-of-door plants, they cannot be smoked to death, the next resource is syringing with tobacco-water or soapsuds, or even clear water; for many will be destroyed every time, and continual disturbance has a good benefit, even if they are not killed. (*Gard. and Flor.* i. 22.)

The *Thrips ochraceous* is of the same genus, and very much resembles that tittilating insect *(Thrips physapus)* so tormenting to the face in summer. It is narrow and linear, of a bright and deep ochreous colour, the eyes are black, the horns appear to be only six-jointed, and brownish at the tips; it has three ocelli in the crown; the body is hairy, the tip pointed and bristly; the wings are shorter than the body in the male, lying parallel on the back when at rest, narrow, especially the under ones, and fringed; the hairs longest beneath and at the point; tips of feet dusky. (*Gard. Chron.*)

USES.

Every part of the dahlia may be usefully employed in times of need.

Stalks and Leaves.—In Prussia, these have been found to make a wholesome food for pigs, sheep, and asses; they are also eaten by deer and cows, and they are, in a dried state, readily eaten by lambs and young goats. When cultivated as cattle food, the stalks may be cut over two or three times in one season. The tubers may be eaten both by men and cattle, but they are neither so agreeable nor so nourishing as those of the potato. (*Prussian Hort. Trans.* i.)

The Tubers.—The reason of these not being palatable, though those of the congenous plant, the Jerusalem Artichoke, are generally relished, arises from the former containing a bitter principle of so acrid a nature, that its general employment as food has always been hitherto despaired of. The *Journal de Chambery* states, however, that this bitter principle is removed by boiling, much in the same manner as the potato is cooked. If this be so—but we have no experience on the point—the dahlia root might, in some measure, be substituted for the potato during times of scarcity. (*Medical Times.*)

Flowers.—We have seen a specimen of a kind of carmine, very brilliant and very pure, obtained by Mr. Rupprecht, of Vienna, from the florets of the dahlia. He regards it as a valuable product, and says that he has obtained 235lbs. of pigment from 200 square fathoms of land. It has already been applied to staining confectionery, artificial flowers, fancy paper and leather, and in the preparation of rouge. It seems, however, too fleeting for silks and cottons. Only the deep clear purple dahlias will yield it. (*Gard. Chron.* 1841, 119.)

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